THE BONNIE CREEK SITE: A LATE MISSISSIPPIAN HOMESTEAD IN THE UPPER GALUM CREEK VALLEY, PERRY COUNTY, ILLINOIS

MARK J. WAGNER

with contributions by
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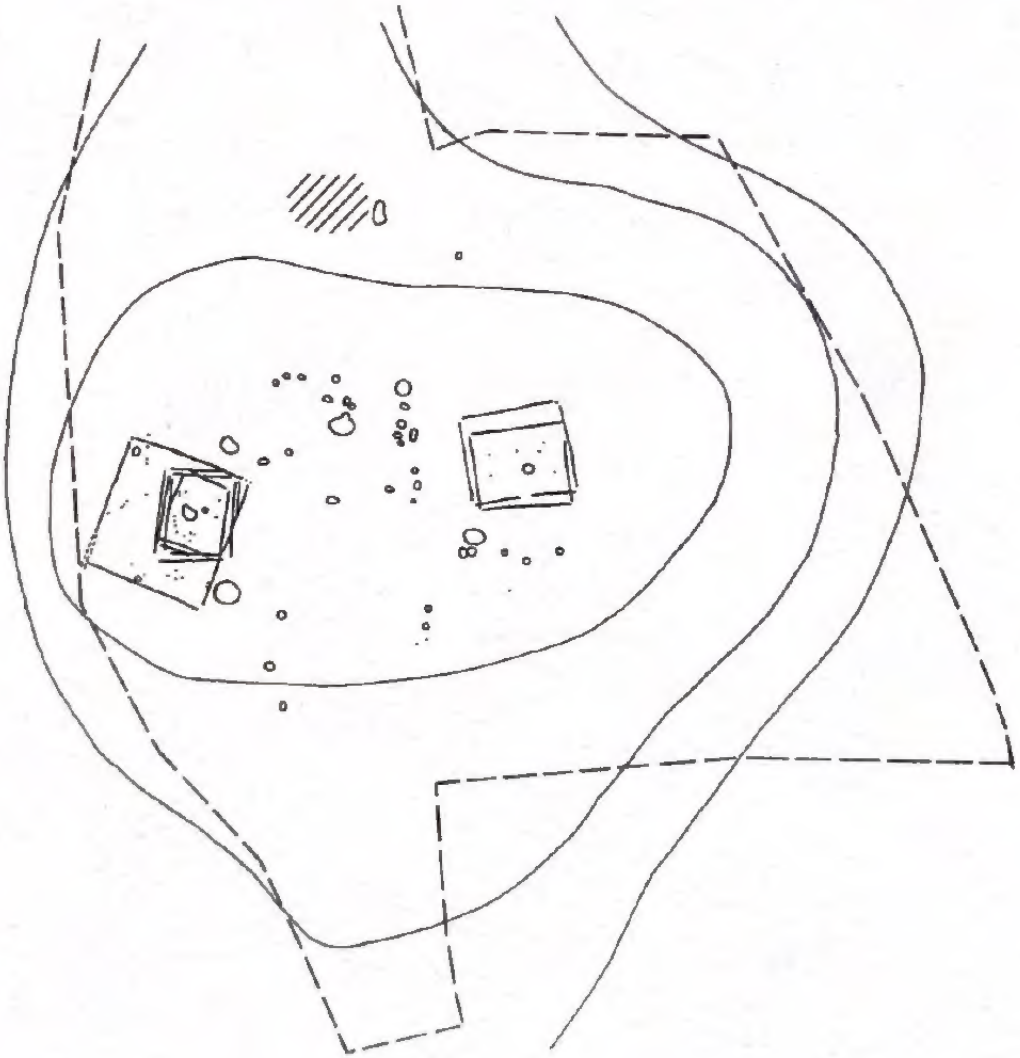

AMERICAN RESOURCES GROUP, LTD.

PRESERVATION SERIES 3

THE BONNIE CREEK SITE: A LATE MISSISSIPPIAN HOMESTEAD IN THE UPPER GALUM CREEK VALLEY, PERRY COUNTY, ILLINOIS

Phase III Excavations
at Consolidation Coal Company,
Northfield, Burning Star Mine #4

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PREFACE

This report is the third volume in American Resources Group, Ltd.'s, Preservation Series. It presents the results of archaeological investigations conducted by American Resources Group, Ltd., for the Midcontinent Region of Consolidation Coal Company at Burning Star Mine #4 in southern Illinois. The research is funded by the company and fulfills state and federal surface mining regulations as they relate to cultural resources.

Future volumes in the series will present the results of ongoing survey and mitigation activities conducted by American Resources Group, Ltd., for Consolidation Coal Company as well as other preservation and cultural resource topics. Those volumes which relate to cultural resource assessments in the till plains physiographic region of southern Illinois will explore a variety of research questions including prehistoric settlement patterns, subsistence strategies, chert exploitation, stone tool technology, and ceramic change. Much historical and historic archaeological research is being conducted and will also be presented in future volumes.

We would like to thank Consolidation Coal Company for their commitment to preserving the cultural heritage of Illinois. Thanks also to Vic Ordija and the many other employees of Consolidation Coal Company's Illinois operations for their fine support and cooperation.

MJM

ABSTRACT

During the summer and fall of 1983, American Resources Group, Ltd., conducted archaeological investigations at the Bonnie Creek site (21C4-46), a Mississippian homestead site located in Perry County, Illinois, as part of a larger cultural resource mitigation project in the Consolidation Coal Company's Burning Star Mine #4. These investigations revealed that 2 structural complexes containing 7 building episodes and 46 pit features were present at the site. The structural complexes were located to the east and west of a central area that contained the majority of the pit features at the site. Based on overlapping wall trenches in one of the structural complexes, at least two separate Mississippian occupations occurred at the site. Detailed information regarding Mississippian house construction techniques in the upper Galum Creek valley was provided by a burned structure possessing numerous intact wall and roof poles. Botanical data from the pit features indicate that subsistence activities included the cultivation of maize, beans, and squash. Wild plant foods were poorly represented. Faunal data indicate a concentration on upland terrestrial species, especially the white-tailed deer. Based on the subsistence data, the site is interpreted as a year-round occupation. The ceramic assemblage is similar to ceramics associated with Moorehead phase occupations in the American Bottom region of Illinois. The lithic assemblage indicates a concentration of locally available lithic materials with nonlocal cherts from Missouri, the American Bottom, and Union County, Illinois, present in small quantities. Radiocarbon dates obtained on wood elements from the two structural complexes indicate that the Mississippian occupation occurred beteen ca. A.D. 1200-1350.

ACKNOWLEDGEMENTS

The authors wish to thank the personnel of the Consolidation Coal Company, paricularly Mr. Vic Ordija, for their assistance in the completion of this project. The hard work put in by the archaeological field crew under sometimes adverse conditions is also acknowledged. The archaeological field personnel included, at various times, Jonathan Bloom, Alan J. Brown, Bonnie L. Gums, David Herdrich, George R. Holley, Sarah McNerney, Michael J. McNerney, Scott Miller, Mary R. McCorvie, Jerry Moore, Julie Phillips, and Mark J. Wagner. The initial processing of the recovered materials was performed by the same individuals. Specialized analyses of the recovered materials were conducted by the following people: Dr. William Cremin, botanical; Leonard Blake, corn analysis; Jonathan Bloom, faunal analysis; Mary R. McCorvie, osteological analysis; Mark J. Wagner, ceramic analysis; Brad H. Koldehoff, lithic analysis. Insect exoskeleton fragments from the pit features were identified by Dr. Lloyd Knutson, United States Department of Agriculture, and Dr. D. R. Whitehead. David De Fant assisted Dr. Cremin in the analysis of the botanical material. Mark Phillips, Sarah McNerney, and Jim Balsitis prepared the figures used in this report, while Sarah McNerney prepared the photographic plates. Photographs of the modified faunal material were taken by Thomas W. Gatlin. Finally, all of the ARG personnel, including Joan Listen and Linda Ober who participated in the word processing, editing, and technical preparation of this report, are thanked.

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CHAPTER I. INTRODUCTION

Mark J. Wagner

This report presents the results of hand and mechanical excavations at the Bonnie Creek site (21C4-46), a Mississippian site located in the Northfield, Burning Star Mine #4, Perry County, Illinois. The Northfield is located along upper Galum Creek, northeast of Cutler, Illinois (Figures 1 and 2), and is an extension of mining operations which began south of Jamestown. Approximately eight square miles (2,023 ha) are contained in the research area, which is drained by Galum Creek and two intermittent tributaries, Rock Fork Creek on the west and Bonnie Creek on the east.

These excavations were part of a larger cultural resources assessment project which included the location and assessment of all archaeological sites located within the Burning Star Mine #4 (Haas and McNerney 1980). The location and assessment of cultural resources are now required for any undertakings which necessitate federal permits or licenses by authority of Public Law 93-291, Sections 3 and 4, Archaeological and Historic Conservation Act, 1974. Other legislation relevant to this research include the National Historic Preservation Act of 1966 and Executive Order 11593. The diversions of Galum Creek and related alterations of the environment at the Northfield require a federal permit by authority of Public Law 92-500 (amended 1977), Federal Water Pollution Control Act, 1972. Such permits are issued by the Secretary of the Army, acting through the Chief of Engineers (PL-92-500). The Illinois Surface Coal Mining Land Conservation and Reclamation Act (PA81-1015) also encourages the protection of cultural resources (Section 7:02.[b][2]).

Test excavations began at the Bonnie Creek site in June 1983. Mechanical excavations including the complete removal of the site plow zone were conducted in July and August 1983. Laboratory analysis, research, and report preparation were carried out in the fall and winter of 1983.

Environmental Setting

The following discussion is limited to a description of the environment in the immediate site area. Detailed information regarding the climate, physiography, hydrography, pedology, vegetation, and fauna of the Burning Star Mine #4 can be found in Haas and McNerney (1980:7-

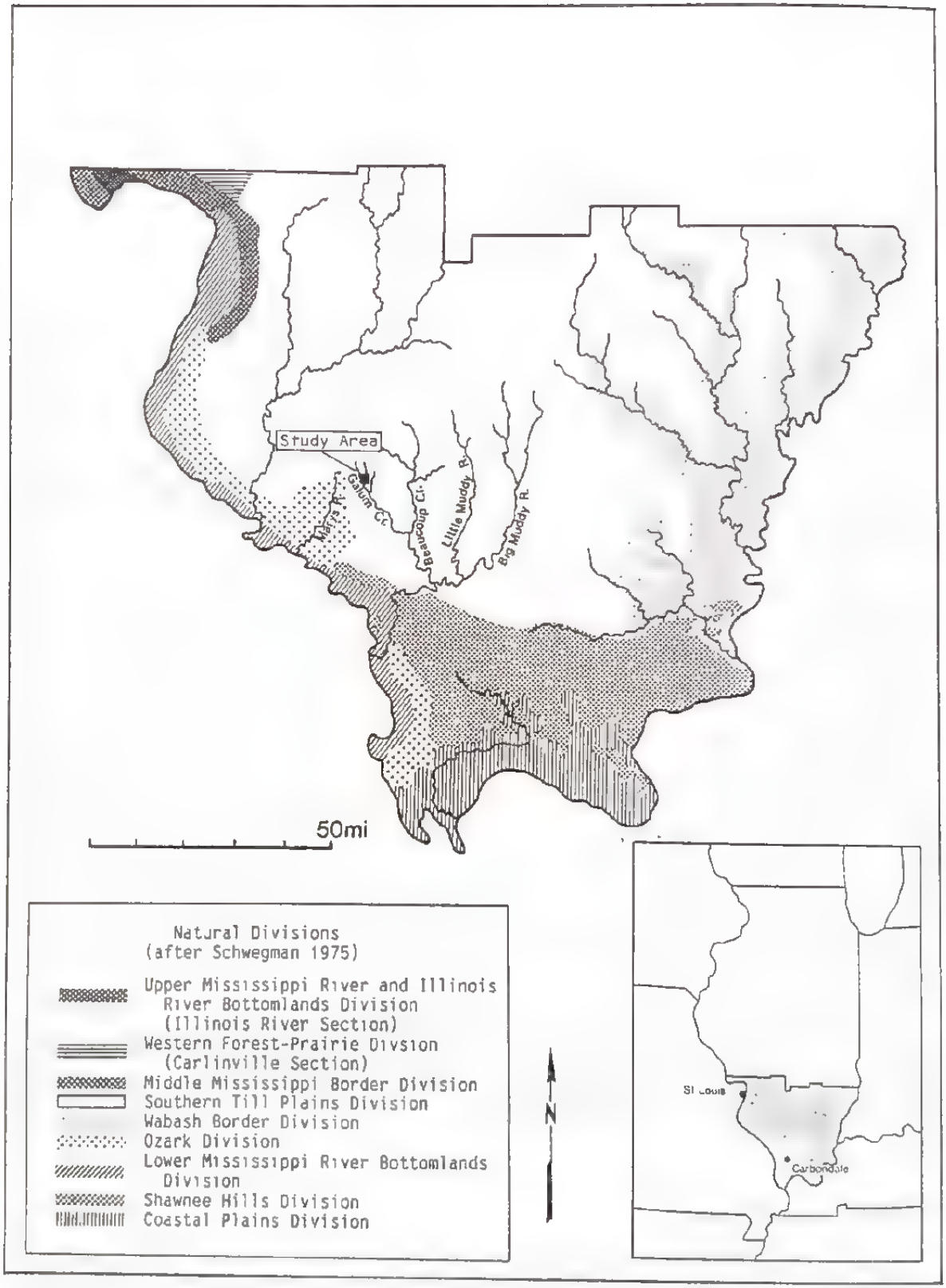


Figure 1. Physiographic setting, Northfield study area.

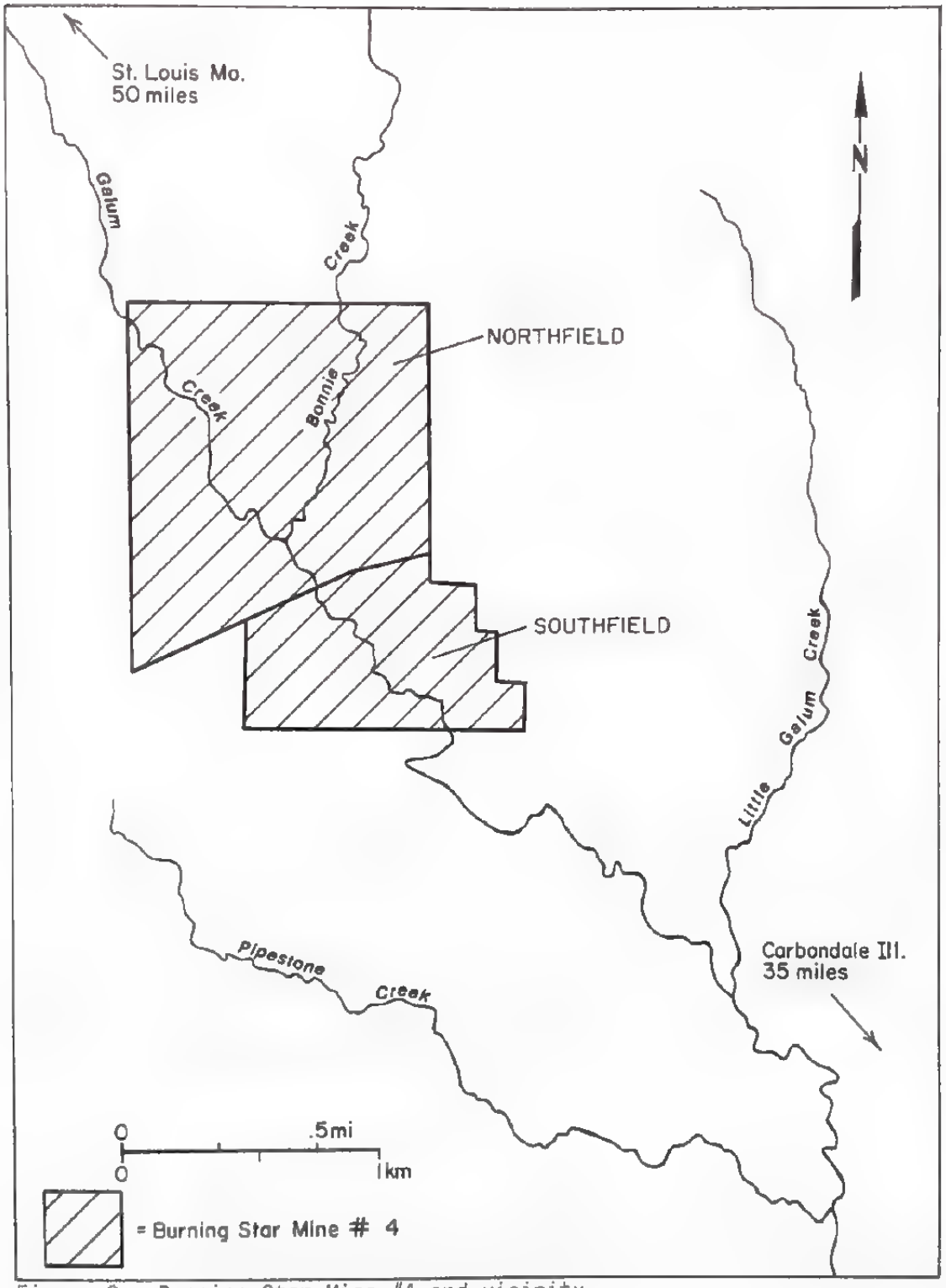


Figure 2. Burning Star Mine #4 and vicinity.

39: 1986). The reader is referred to those reports for further information.

The Bonnie Creek site was located in the upper reaches of Galum Creek, a tributary of Beaucoup Creek which is part of the Big Muddy River drainage (Figure 1). The site was located on the top of a nearly level north-south oriented ridge spur at an elevation of 135 m (450 ft) ASL overlooking the Bonnie Creek floodplain (Figure 3). The creek is located approximately 76 m (250 ft) to the southeast. An old channel scar was located at the base of the ridge, indicating that Bonnie Creek once flowed immediately adjacent to the site. The confluence of Galum and Bonnie creeks was located 335 m (1,000 ft) due south of the site. Although Bonnie Creek is listed as an intermittent stream on the USGS quadrangle map, the lower portion of the creek in the site vicinity holds water year-round. Pools of water containing fish and mollusks can be found in the upper reaches of the creek even in midsummer.

The valley bottom east of the site is broad and flat, varying in width from 1,100 to 2,000 ft. The Bonnie Creek stream channel is narrow and twisting, and the valley was subject to repeated flooding during the spring of 1983 following periods of heavy rain. Some of this flooding may be associated with the channelizaton of the upper portion of Galum Creek with the increased water volume causing Bonnie Creek to back up and overflow during periods of heavy rain. Older visitors to the site, however, stated that heavy flooding of Galum and Bonnie creeks occurred as early as the 1930s, long before the creeks were disturbed heavily by coal mining activities.

Vegetation

The natural vegetation of the bottom has been severely disturbed by farming, with second growth forest restricted to the margins of Bonnie Creek and fencelines. Based on the presence of Bonnie-Belknap soils, presettlement floodplain vegetation would have consisted of a bottomland forest. Englemann's (1863:394) description of the bottomland forest communities in Jackson and Perry counties states that ". . . The timber is heavy and very tall and consists principally of the swamp white oak (Quercus bicolor) and the pin oak (Q. palustris), with some scaly barked hickory (Carya alba), but where the creeks enter the limits of the underlying limestones and shales, the growth is much more varied and consists, in addition . . . of bur oak (Q. macrocarpa), red oak (Q. rubra), laurel oak (Q. imbricaria), ash, black walnut, hazel, and many others."

McNerney (1974:10) reported that the bottomland forest community in western Perry County was dominated by the pin oak (Q. palustris), white oak (Q. bicolor), ash (Carya spp.), elm (Ulmus spp.) and gum (Nyassa sylvatica). Spanish oak (Q. falcata) and shagbark hickory (C. ovata) were also present. Jenkusky et al.'s (1979) survey of the bottomland and upland plant communities in the mine area divided the vegetation in these areas into dominant overstory vegetation over 10 ft in height and dominant vegetation under 10 ft in height. The dominant overstory vegetation in the bottomland consisted largely of box elder (Acer

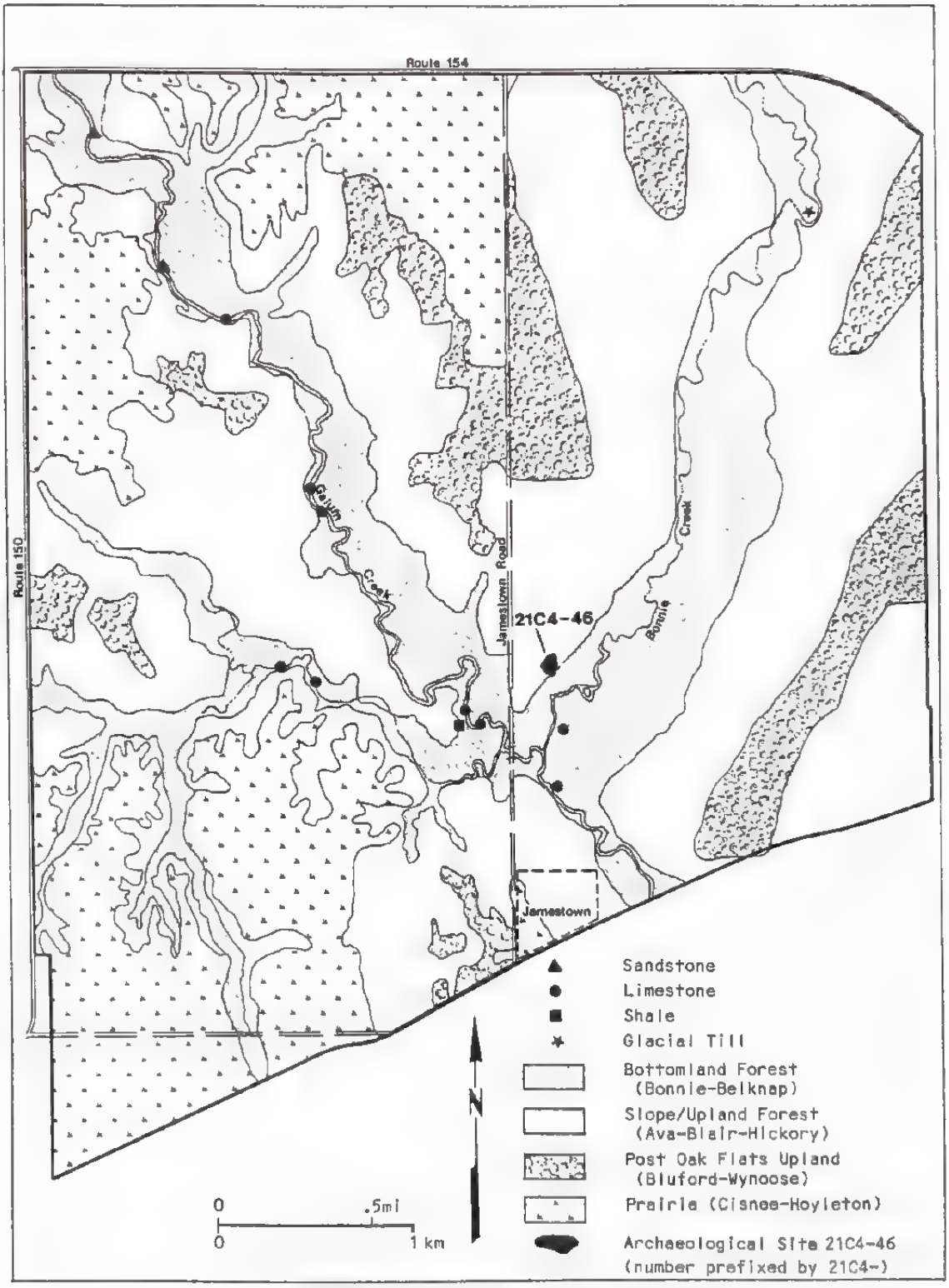


Figure 3. Local environmental setting, Northfield study area.

negundo), sugar maple (A. saccharum), river birch (Betula niger), and silver maple (A. saccharinium). Species present in minor quantities included hackberry (Celtis accidentalis), sourgum, pin oak, wild black cherry (Prunis serotina), honey locust (Gleditsia tricanthos), shingle oak, green ash (Fraxinus pennsylvanica), and sycamore (Platanus spp.) (Table 1). The absence of oaks and black walnut in this most recent survey probably is associated with historic land clearing practices and the modern economic value of these species.

Table 1. Dominant Overstory Vegetation* of Lowland-Riparian Forest Transect, Jamestown North Area (from Jenkusky et al. 1979).

Species**	Percent Composition	Density #/Acre	Average DBH Inches
Box Elder	37.7	134	8.2
Sugar Maple	22.3	79	6.7
River Birch	12.4	44	11.2
Silver Maple	7.3	26	12.2
Hackberry	2.5	9	8.3**
Sourgum	2.5	9	8.0**
Pin Oak	2.5	9	3.5**
Wild Black Cherry	2.5	9	10.5**
Honey Locust	2.5	9	23.6**
Shingle Oak	2.5	9	4.5**
Green Ash	2.5	9	14.0**
Sycamore	2.5	9	17.5**

*Over 10 ft high and DBH greater than 2.5 in.

**Only one in sample

The importance of the oak-hickory forest community to prehistoric societies in eastern North America has been demonstrated repeatedly (Chapman and Shea 1981:61-84; Faulkner and McCollough 1973; Johannessen 1984). The shagbark hickory produces a sweet nut which can be collected from September through December. This nut can be eaten fresh or stored for later use (Zawacki and Hausfater 1969:18). The nut crops of the bur oak, white oak, red oak, pin oak, and black walnut (Juglans nigra) also are known to have been utilized by historic American Indian groups (Yanovsky 1936:16-18). Other bottomland tree species with known aboriginal uses include the black cherry, green ash, silver maple, hackberry, honey locust, and box elder. The fruit of the black cherry can be eaten fresh or dried, while the twigs can be used to produce a beverage (Yanovsky 1936:35). The cambium of the green ash and the sap and bark of the silver maple also can be used as food (Yanovsky 1936:52,42). The fruit of the hackberry becomes available in August and can be collected all winter. Historic Indians pounded the fruit and mixed it with parched corn and fat (Faulkner and McCollough 1973:19). Sugar can be obtained from the honey locust and the box elder (Zawacki and Hausfater 1969:32).

Jenkusky et al. (1979) identified a bottomland understory plant community consisting of 29 species with stinging nettle, jewel weed, cream violet (Viola striata), and buttercup (Ranunculus spp.) comprising 64.6% of the identified plants (Table 2). Plants with identified aboriginal food use include the sedge (Cyperacae), Virginia creeper (Parthenocissus quinquefolia), wild onion (Allium canadense), and spicebush (Lindera benzoin) (Yanovsky 1936:9, 11-12, 26, 42). The stems and tuberous bases of the sedge were eaten as were the bulbs of the wild onion. The leaves of the spicebush can be used as a tea substitute, while the stalks and fruit of the Virginia creeper were eaten.

Zoanetti (1974:1-40) separated the uplands of the upper Galum Creek drainage into three environmental zones on the basis of soil types and plant communities (Figure 4). These were the slope woodlands, post oak flats, and prairie zones. The Bonnie Creek site was located entirely within the slope woodland zone, while sections of the post oak flats and prairie were located within a mile of the site (Figure 3). Haas and McNerney (1986:15) define the slope woodland zone as a transitional environmental zone with the vegetation on the lower slopes and small drainageways being similar to the bottomland, while the upper slopes are more similar to the post oak flats. Zoanetti (1974) recognized white oak and black oak as being the dominant tree species within the slope woodland zone, while red oak and pignut hickory were important subdominant species.

Sections of the post oak flats are located less than 1/2 mi north and 2/3 mi to the south and southeast of the Bonnie Creek site (Figure 3). The post oak flats generally coincide with the Bluford-Wynoose soil association. The flats are nearly level stretches of upland with widely dispersed open woods dominated by post (Q. stellata) and black jack (Q. marilandica) oaks. Little undergrowth was present within these woods in comparison to the bottomlands (Englemann 1863:390). Zoanetti (1974:8-9) noted that other other oaks and hickories can be found in certain areas

Table 2. Dominant Vegetation Under 10 ft of Lowland-Riparian Forest Transect, Jamestown North Area (from Jenkusky et al. 1979).

Species	Percent Composition
GROUND COVER*	
Stinging Nettle	31.0
Jewel-Weed	12.6
Cream Violet	12.3
Buttercup	8.7
Green Ash	4.4
Sedge	4.2
Poison Ivy	3.6
Virginia Creeper	2.9
Sweet-Scented Bedstraw	2.4
Bottlebrush Grass	2.4
Blue-Eyed Mary	2.1
Violet	2.0
Fowl Manna Grass	1.9
Virginia Cowslip	1.6
Common Blue Violet	1.3
Wild Onion	1.2
Cat Brier	1.1
Slippery Elm	1.1
Spicebush	0.6
Box Elder	0.6
Gray's Sedge	0.5
Water Hemlock	0.5
Self-Heal	0.5
Hackberry	0.3
Goldenrod	0.2
Japanese Honeysuckle	0.2
Blue Phlox	0.1
UNDERSTORY**	
Green Ash	83.3
Spicebush	16.7

*Vegetation, 0 to 1 ft high, covered 78.6% of transect

**Vegetation, 1 to 10 ft high, covered 6.0% of transect

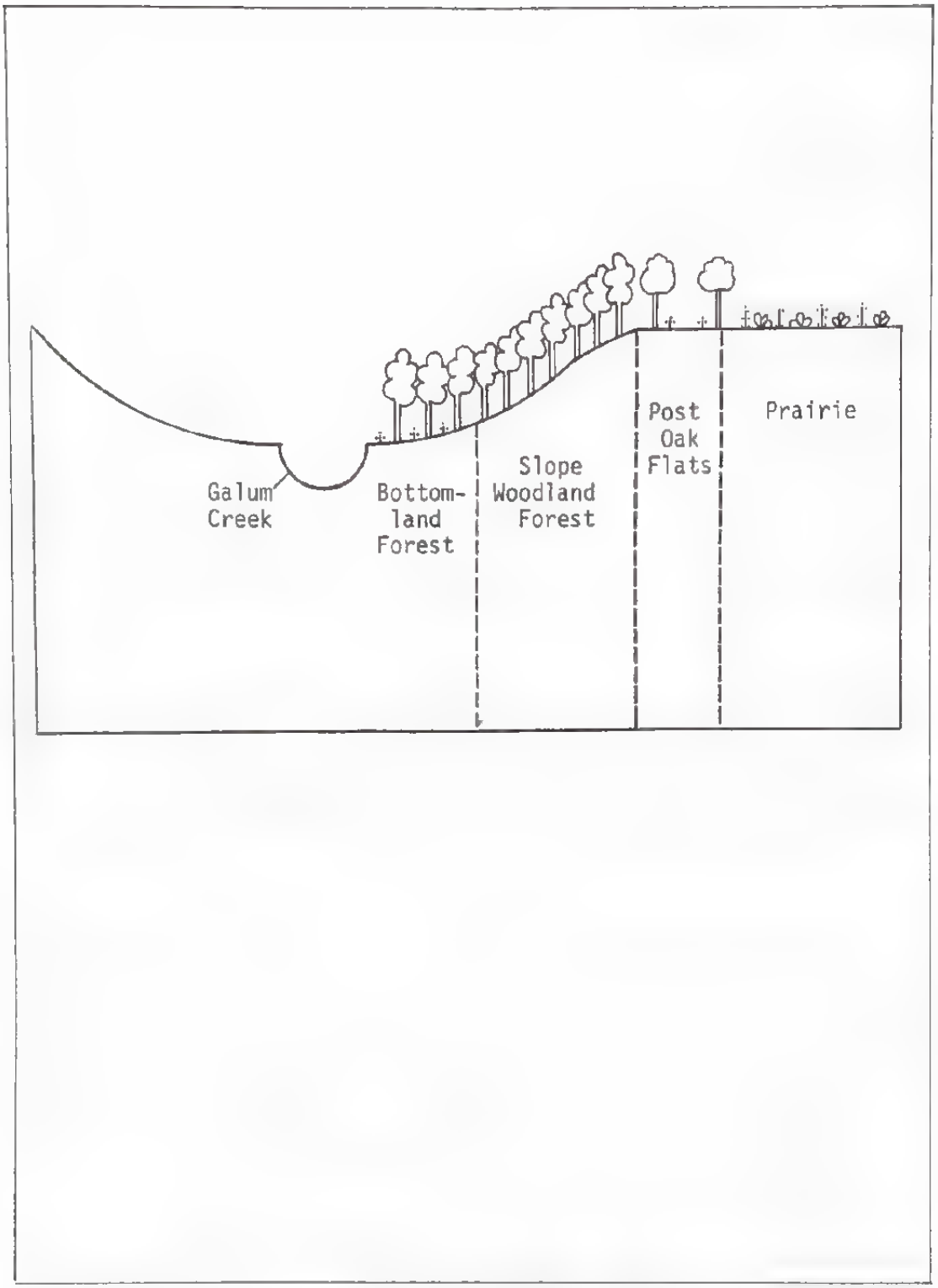


Figure 4. Ideal environmental cross section, Upper Galum Creek locality.

of the post oak flats, with pin oaks and shingle oaks (Q. imbricaria) occurring in wet areas.

Jenkusky et al.'s (1979) survey of the uplands within the mine failed to distinguish between the post oak flats and the slope woodland forest zones (Table 3). On the basis of the wide species diversity recorded (and the absence of post and black jack oaks), it would appear that their survey applies to the slope woodland forest zone. The upland overstory was comprised of 10 species, with red oak, black oak, pignut hickory (C. glabra), white oak, shagbark hickory, and sweet pignut hickory comprising 79.9% of the vegetation. All six of these nut-bearing trees were utilized by historic Indian groups (Yanovsky 1936). With regard to the other species, the cambium of the slippery elm could be eaten in the spring, while sugar could be obtained from the sugar maple (Zawacki and Hausfater 1969:34). The upland understory was comprised of 18 species, with mayapple (Podpphyllum peltatum), Virginia creeper, and slippery elm making up 91.2% of the ground cover (Table 4). Previously mentioned food resources within this understory include the slippery elm, Virginia creeper, green ash, wild black cherry, and shagbark hickory. The bulbs of the white dog toothed violet (Erythronium albidum) could be eaten raw, while the berries of the false Solomon's seal (Smilaucina racemosa) can be collected in the fall (Zawacki and Hausfater 1969:26,36). Both the red mulberry (Morus rubra) and mayapple produce edible fruit (Yanovsky 1936).

Prairie areas (defined on the basis of Cisne-Hoyleton soils) were located within 1 mi north and 1/2 mi southwest of the Bonnie Creek site (Figure 3). Voight and Mohlenbrock (1964) note that southern Illinois prairies were comprised of big bluestem (Andropogon gerardii), Indian grass (Sorghastrum nutans, wild rye (Elymus canadensis), switch grass (Panicum virgatum), and slough grass (Spartina pectinata). In terms of wild plant foods, the prairies would have contained the least resources of the four environmental zones within the upper Galum Creek valley.

Fauna

Prior to Euro-American settlement, the upper Galum Creek valley would have contained a wide variety of avian, mammalian, and aquatic fauna. The destruction of habitats as the result of deforestation and land clearing associated with farming undoubtedly resulted in the extirpation of many species. Nevertheless, Jenkusky et al.'s (1979) survey of the mine area documented that a diverse animal population still existed within the upper Galum Creek valley. The Bonnie Creek site's location on the edge of a ridge spur overlooking the creek floodplain would have allowed its inhabitants to exploit fauna from both the bottomland and upland environments.

The bottomland would have contained the widest range of faunal species. Jenkusky et al. (1979) documented that 17 of 32 potential fish species native to southern Illinois were present in Galum Creek. All of these fish are characteristic of species that prefer muddy bottomed, low gradient creeks. Prior to the introduction of farming and the subsequent erosion of soil into the creeks, the Galum Creek drainage probably

Table 3. Dominant Overstory Vegetation* of Upland Forest Transect, Jamestown North Area (from Jenkusky et al. 1979).

Species**	Percent Composition	Density #/Acre	Average DBH Inches
Pignut Hickory	27.3	118	7.8
Sweet Pignut Hickory	17.4	75	5.6
Shagbark Hickory	15.0	65	6.0
White Oak	15.0	65	8.5
Green Ash	7.4	32	3.1
Slippery Elm	5.1	22	3.0
Red Bud	5.1	22	2.9
Red Oak	2.5	11	20.1**
Black Oak	2.5	11	14.3**
Sugar Maple	2.5	11	3.2**

*Over 10 ft high and DBH greater than 2.5 in.

**Only one in sample

supported additional fish species that have low tolerances for disturbed habitats. Game species in the Galum Creek drainage include the largemouth bass (Micropterus salomides), green sunfish (Lepomis cyanellus), longear sunfish (L. macrochirus), white crappie (Proxomis annularis), bluegill (L. macrochirus), and pirate perch (Aphredoderus sayanus). Rough fish include the black bullhead catfish (Icatalurus melas), creek chub (Semotilus atromaculatus), golden shiner (Notemigonus crysoleucous), redfin sniner (Notropis chiliticus), and the creek chubsucker (Erimyzon oblongos). Small fish species consisted of the bluntnose minnow (Pimephales notatus), flathead minnow (P. promelas), blackstripe topminnow (Fundulus notatus), and slough darter (Percidae spp.). This is a relatively restricted range of species, and fish may not have represented an important food resource to the Bonnie Creek site inhabitants. Further, as Faulkner and McCollough (1973:42) have noted,

Table 4. Dominant Vegetation Under 10 ft of Upland Forest Transect, Jamestown North Area (from Jenkusky et al. 1979).

Species	Percent Composition
GROUND COVER*	
Mayapple	48.8
Virginia Creeper	22.4
Slippery Elm	20.0
False Solomon's Seal	2.4
Red Trillium	1.4
Green Dragon	1.4
Green Ash	1.2
White Dog-Toothed Violet	1.0
Common Cinquefoil	0.6
Wild Black Cherry	0.4
Sweet-Scented Bedstraw	0.2
UNDERSTORY**	
Slippery Elm	53.4
Green Ash	18.4
Red Mulberry	16.9
Red Bud	8.5
Shagbark Hickory	2.8

*Vegetation 0 to 1 ft high, covered 40.8% of transect

**Vegetation 1 to 10 ft high, covered 70.8% of transect

the Centrarchidae (basses, sunfish, and crappies) prefer deeper pools and do not congregate in large numbers during spawning. As a result, they probably could not have been netted or trapped in large numbers and may have represented a minor food resource.

The range of molluscan species within the study area is unknown. Disturbances to the creek from soil runoff and mining activity have resulted in the extirpation of most molluscan fauna in this section of the Galum Creek drainage. Live specimens identified as "floaters" (Anadonta grandis) were recovered as isolated individuals from the upper reaches of Bonnie Creek during the course of the field investigations. The recovery of shell-tempered ceramics at Mississippian sites such as Bonnie Creek inidicate that molluscan fauna were numerous enough to be collected and used in the manufacture of ceramic vessels during this time period. It is doubtful if they occurred in large enough quantities to represent a significant food resource given the small size of Bonnie, Rock Fork, and Galum creeks.

Semiaquatic fauna present within the project area that prefer a bottomland environment include the mink (Mustela vison), beaver (Castor canadensis), raccoon (Procyon lotor), and muskrat (Onoodatra zibethica) (Jenkusky et al. 1979:15). Other animals present within the bottomland in 1979 but which also occur in the uplands include the opossum (Didelphia virginia), gray fox (Urocyon cineoargentus), eastern gray squirrel (Sciurius carolinesis), fox squirrel (S. niger) and southern flying squirrel (Glaucomys volans). Animals not recorded by Jenkusky et al. (1979) but noted during the course of excavations in the mine include the striped skunk (Mephitis mephitis), groundhog (Marmota momax), and white-tailed deer (Odocoileus virginianus). Amphibians and reptiles documented within the bottomland incuded black racer snakes, the eastern box turtle (Terrapene carolina carolina), and the midland painted turtle (Chrysemys pictamarginata). Jenkusky et al. (1979) recorded no avian fauna in the project area with the exception of the green heron, but the Canadian goose (Branta canadensis), mallard duck (Anas carolinesis), redtailed hawk (Buteo platypterus), and turkey vulture (Carthaartes aura) were observed in the Galum Creek area during the archaeological investigations. Ducks and geese may not have been as prevalent prehistorically in the project area as they are today. The old strip mine pits in the Southfield area of Burning Star Mine #4 have been converted into lakes that attract large numbers of these birds.

Upland fauna recorded by Jenkusky et al. (1979) include the gray fox, eastern gray squirrel, eastern fox squirrel, southern flying squirrel, and white-tailed deer. The wild turkey (Meleagris gallopavo) is present in the uplands of Perry and Randolph counties and undoubtedly was present within the upper Galum Creek valley at one time. Turkeys may have been hunted throughout the year although they are most easily hunted during the fall and winter when they congregate in large flocks in upland areas to feed on nut mast (Faulkner and McCollough 1973:48-49).

Animal species now extirpated from the project area that would have represented potential food resources include the American elk (Cervus

canadensis), black bear (Ursus americanus), and passenger pigeon (Ectopoistes migratorius). Elk remains have been recovered from pit features at the Jamestown site (21C4-14), a large Late Woodland site located less than 1/2 mi south of the Bonnie Creek site. Other large mammals known to have been present in Perry and Randolph counties during the historic period include the cougar (Felis concolor) and gray wolf (Canis lupus), with bounties offered for wolves during the early nineteenth century in Randolph County. Robert Huggins, an early settler in both Randolph and Perry counties, received a bounty for turning in a wolf scalp at Kaskaskia in 1804 (McDonough 1883:101). Passenger pigeon remains were recovered from the Davis site (21D3-246), an early to mid-nineteenth century American farmstead along Beaucoup Creek, indicating that these birds were present in Perry County.

Lithic Resources

Lithic materials present within the upper Galum Creek valley include limestone, shale, sandstone, limonite, galcial redeposited chert, and igneous/metamorphic rock (Figure 3). Limestone outcrops in bedded formations throughout the three creeks but is more prevalent in the southern half of the project area near the confluence of Bonnie, Galum, and Rock Fork creeks. Limestone exposures are present in Bonnie Creek immmediately east of the Bonnie Creek site. During the Mississippian period, limestone was used in the construction of graves throughout southern Illinois and other parts of the southeast and midwest. Such graves were present in the project area at a mortuary site (21C4-9) and at two homestead sites, the Bonnie Creek site and the Galum Crossing site (21C4-29).

Shale, used in the construction of these graves, may grade into fine sandstone or shaly limestones. The shale within the upper Galum Creek valley ranges from blue gray to black in color, with traces of the original bedding present. Shale was not commonly used on archaeological sites within the Burning Star Mine #4; however, it was used in association with limestone for the construction of graves at the Mississippian mortuary site (21C4-9), and graves constructed entirely of shale were found at a habitation site (21C4-34) in the project area.

Sandstone occurs in bedded formations in the upper reaches of Galum Creek near the Galum Crossing site (21C4-29) but has a limited distribution throughout the remainder of the mine area. Sandstone was present in fairly large quantities at the Bonnie Creek site and was used primarily for the construction of metates, abraders, and hearthstones.

Limonite is an iron ore that occurs in stream beds and eroded bank cuts in the upper Galum Creek valley. Concretious limonite may also occur in sandstone. Limonite is a soft yellowish brown ore with a hard exterior rind. One source area was documented in the mine area in an eroded bank cut in the Bonnie Creek valley immediately adjacent to site 21C4-132.

The glacial redeposited chert type consists of small chert cobbles that were deposited by glacial activity in the stream beds and exposed

drift deposits of the till plains. These cobbles are generally small and of variable quality. The color range includes white, brown, and gray. In the Northfield area, glacial chert cobbles can be collected from the beds of Bonnie, Galum, and Rock Fork creeks and as isolates on the landscape. This chert type was extensively utilized throughout prehistory in the upper Galum Creek valley but declines in popularity following the Middle Woodland period.

Igneous/metamorphic cobbles occur throughout the stream beds of the project area. They also occur as isolates on the landscape. Cobbles can also be collected from exposed bank cuts in the till plains, and one such source was documented in the upper reaches of Bonnie Creek immediately north of site 21C4-132 (Figure 3).

Previous Archaeological Investigations

A detailed history of archaeological investigations in southern Illinois has been presented in Haas and McNerney (1986), and the reader is referred to that report for a cultural overview of the region. A short summary of previous archaeological investigations within Burning Star Mine #4 since 1973 is presented below.

The initial work in the Burning Star Mine #4 consisted of an archaeological survey of the 2,430 acre Southfield area of the mine (Pulcher 1974a). Survey methods consisted of a combination of pedestrian survey of cultivated fields (295 acres) and interviews with artifact collectors and landowners. Wooded areas were inspected for mounds or other features but were not shovel tested. Twenty five sites were located by the survey, 23 of which were in cultivated fields. Evidence of Archaic, Middle Woodland, Late Woodland, and Mississippian occupations was found (Figure 5). Site size ranged from 1,925 to 15,750 square meters, indicating possible functional or occupational differences among the sites in the Galum Creek valley. Three Mississippian stone grave cemeteries and two possible Late Woodland burial mounds also were located. In addition to the Southfield, the surveyors also recorded sites in the area that would eventually become the Northfield of Burning Star Mine #4 (Pulcher 1974a:36-41). Twenty sites (including the Bonnie Creek site) were recorded on the basis of interviews and site visits along Bonnie, Galum, and Rock Fork creeks. Archaic, Late Woodland, and Mississippian occupations were identified, with one Mississippian stone grave cemetery (21C4-9) recorded.

Salvage excavations were conducted concurrently with the survey at two sites, Brune (21D3-9) and Burning Star (21C4-3), that were being destroyed by mining activities (Figure 5). These excavations revealed that the Brune site was multicomponent with two Late Woodland basins and six Mississippian features including a rectangular wall trench structure, at least four basins, and an extended burial in a limestone slab grave found within a 2,925 square meter area of the site. Local informants stated that 30 to 40 burials in stone graves had been present at the site at one time. Based on the presence of cordmarked shell-tempered ceramics and incised plates, the Mississippian occupation of

Figure 5. Distribution of archaeological sites, Southfield, Burning Star Mine #4 (adapted from McNerney 1974).

the Brune site was suggested to date between A.D. 1250-1500 (McNerney 1974:53).

The Burning Star site (21C4-3) was located on a ridge top immediately east of Galum Creek and approximately 3,000 m southeast of the confluence of Bonnie, Galum, and Rock Fork creeks. The site had been almost entirely destroyed by strip mining, but excavation of the remaining portion recovered 49 late Woodland features including a pit structure, 10 human burials, and possible cooking and storage pits. A radiocarbon sample from one of the pit features returned a date of A.D. 750±220-250 (Pulcher 1974:109). The ceramic assemblage consisted of jars, bowls, miniature vessels, and figurine fragments (Pulcher 1974b:78-87). Decorations included interior punched nodes, appliqued nodes, and interior and exterior notched rims. Projectile points/knives included shallow side-notched specimens similar to the Lowe Flared Base and Lewis artifact types and small arrow points manufactured on flakes (Pulcher 1974b:87). The faunal remains indicated a reliance on deer although other mammalian as well as avian and fish remains were recovered. The botanical remains indicated a reliance on nuts (Carya sp.) as opposed to seeds. Pulcher (1974b:108-109) interpreted the site as a fall-winter occupation on the basis of the recovered data but suggested that the site may have been occupied during the warm weather months as well.

The area north of the Burning Star Mine #4 that Pulcher (1974a) had partially surveyed later was acquired by the Consolidation Coal Company and incorporated into the mine as the Northfield. The Northfield measured approximately 5,000 acres (2,023 ha), was contained entirely within Perry County, and contained the confluence of Bonnie, Galum, and Rock Fork creeks. One hundred percent of this area was surveyed for archaeological sites in 1979 through a combination of pedestrian survey, shovel testing, and collector interviews (Figure 6). One hundred and seventeen archaeological sites ranging in date from the Archaic to the historic period were located (Haas and McNerney 1980). The highest prehistoric site density (5/km^2) occurred near the confluence of Bonnie, Galum, and Rock Fork creeks. Late Woodland sites occurred in the highest frequency (n=11) and density (.55 km^2), while Mississippian sites occurred in the same low frequency (n=3) and density (.15 km^2) as the Early Archaic sites. Most of the sites occurred in the slope woodland forest zone (72%), followed by prairie (9%), bottomland (8%), slope woodland/prairie (8%), post oak flats (2%), and bottomland/slope woodland (1.5%). Prehistoric occupations were characterized by light to moderate densities of chert and glacial cobbles. Only two sites, the Galum Crossing (21C4-29) and Jamestown (21C4-14) sites, exhibited organic staining and had heavy artifact densities. Test excavations were conducted at 13 prehistoric sites, with undisturbed deposits or midden found at 6 sites and subsurface features found at 2 sites (Haas and McNerney 1980:371).

A stratified random sample of 38 of the 100 prehistoric sites located by the survey were recommended for mitigation. Key cultural and environmental variables used to insure a representative sample included cultural affiliation, distance from the nearest perennial stream, and

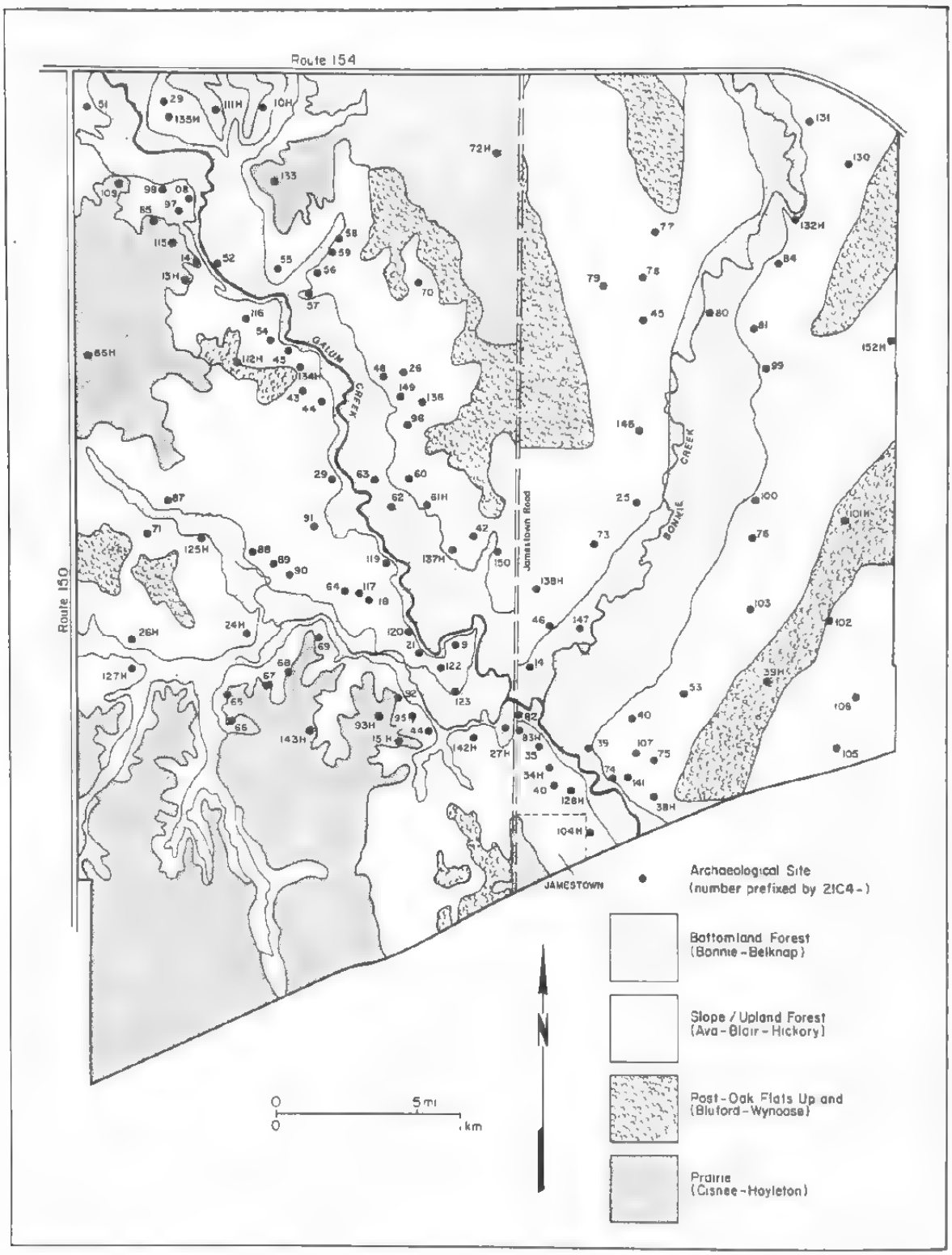


Figure 6. Distribution of archaeological sites, Northfield, Burning Star Mine #4 (adapted from Haas and McNerney 1986).

vegetational context within a 1 mi radius of the site (Haas and McNerney 1980:372).

Test excavations in the mine began in 1981. Because of mining schedules, these initial excavations were concentrated to the west of Jamestown Road as this area of the mine was scheduled to be mined first. Excavations in this area revealed the presence of a large Late Woodland and Mississppian occupation at the Galum Crossing site (21C4-29); intensive Archaic and Woodland utilization of ridge spur sites 21C4-60 and 21C4-129 as nut processing and hunting camps; the presence of an Archaic through Crab Orchard midden at site 21C4-27, a nut collecting and hunting camp on a rise in the floodplain; and the occurrence of a Woodland burial mound (21C4-122) and Mississippian stone grave cemetery (21C4-9) on the same ridge near the creek confluences at the southern end of the project area. Archaeological investigations began west of Jamestown Road in 1983. These revealed that a large, circular Late Woodland village containing over 500 pit features and at least 6 structures was located at the Jamestown site (21C4-14). The features and structures were clustered around a central open area, the center of which was marked by two large centerposts. Radiocarbon dates from the site indicate that it was occupied throughout the late Woodland period but that the circular site pattern dates to approximately A.D. 600-800. Late Woodland occupations were also found at sites 21C4-34 and 21C4-35. The Late Woodland ceramics from these sites are similar to the Raymond and Dillinger ceramic types of southeastern Illinois rather than those from the American Bottom. Mississippian occupations were found to be much more frequent than indicated by the original survey (Haas and McNerney 1980), which had reported that only three Mississippian sites (21C4-9, -14, and -46) were located within the mine. Additional Mississippian occupations including structures were found at sites 21C4-29, -34, and -35. The Mississippian ceramics and radiocarbon dates from these sites indicate that the Mississippian occupation of the area dates to approximately A.D. 1200-1400. In contrast to the preceding Late Woodland period in which the ceramics were similar to those of the Big Muddy River drainage, the Mississippian ceramics exhibit traits such as red slipped plates and cordmarking which are more characteristic of the American Bottom. Although the project area represents only an arbitrary slice of the Galum Creek valley and may not encompass the entire range of prehistoric site types in the region, the information recovered by the excavations indicates that a change in settlement patterns may occur in the area between the Late Woodland and Mississippian periods. During the Late Woodland period, the settlement pattern includes large sites such as the Jamestown (21C4-14), Galum Crossing (21C4-9), and probably the Burning Star (21C4-3) sites which contain large numbers of pit features, structures, and, in the case of the Jamestown site, organized community plans. These sites may represent permanently occupied base camps that are occupied on a year-round basis. Smaller Late Woodland sites (such as 21C4-35) that contain pit features, a limited amount of cultural debris, and lack structures are also part of the settlement system. Evidence of Meso-American cultigens was not found at these sites, with the collection of nut crops (Carya sp.) appearing to be of major importance. The Late Woodland occupation of the area ends with the construction of several Dillinger phase features

at the Jamestown site. In contrast to the Late Woodland settlement system which includes large, intensively occupied sites, Mississippian occupations in the area consist of dispersed communities comprised of one to three structures and associated pit features. Large sites with numerous structures, such as the Bridges site (Hargrave et al. 1983) in the Kaskaskia River valley, were not documented. Based on faunal, botanical, and other data, these small homesteads appear to be occupied on a year-round basis. Subsistence data indicates that the Meso-American triumvirate of maize, beans, and squash was cultivated, with native plant species being of minor importance. Faunal data indicate a concentration on upland terrestrial species with minor utilization of bottomland species such as fish.

Archaeological investigations in the Burning Star Mine #4 were completed in 1984 with the excavation of the Jamestown site. These investigations included the excavation of Archaic, Middle Woodland Crab Orchard, Late Woodland, Mississippian, and historic period Euro-American sites.

CHAPTER II. METHODOLOGY

Mark J. Wagner and Brad Koldehoff

Field Methodology

The archaeological investigations were performed using a combination of .25 m^2, 4 m^2, and larger size excavation units. The .25 m^2 units were used to define the site limits as the initial part of the excavations. A 10 m grid system was superimposed over the site, and a test unit was excavated at the intersection of each 10 m grid line. Each test unit minimally measured .25 m^2 and was excavated at least 10 cm into the culturally sterile subsoil. The bottoms and sides of these units were troweled and all soil zones recorded. A distribution map showing the number and types of material from each shovel test was prepared in the field.

The methodology for the larger excavation units was essentially the same as that used for the smaller units, with some minor exceptions. All units initially were excavated in natural levels with the plow zone removed as a single level. The soil beneath the plow zone was excavated in arbitrary 10 cm levels. All soil from each level was screened through 1/2 in. mesh. A 25 cm x 25 cm x 10 cm deep soil block was left in the southwest corner of each unit. Ten liters of soil were removed from each of these blocks and saved for flotation to recover small botanical and faunal remains. The southwest corner of each unit was recorded in relation to the site datum, and all measurements within each unit were taken from these corners using a line level and a hand-held tape. This corner also was used as a designator for the entire unit, with each unit assigned an individual number. The floor of each unit was troweled and mapped at a 1:20 scale at the base of each level if soil staining was present. If no soil staining was present, a notation to that effect was entered on the unit form and no map prepared. All potential features were mapped and cross-sectioned at the base of the level at which they were defined. The profiles of all features were mapped at a 1:10 scale and photographed. One half of each feature was taken as a flotation sample. All feature fill remaining after the soil samples were taken was screened through 1/4 in. mesh.

The excavation methodology for structures differed from that of other cultural features (i.e., pits and post molds) due to the more complex nature of structures. All wall trenches to the Mississippian structures were mapped and cross-sectioned along their wide axes to obtain profile views. When a wall trench to one structure crossed that of another, additional cross-sections were taken at the point of

intersection to determine the sequence of construction. All fill from within the structure depressions was kept separate from the general level fill and screened through 1/4 in. mesh. Culturally diagnostic material that appeared to be on the structure floors was mapped *in situ* whenever posible. All wooden structural elements such as burned wall and roof poles were mapped, measured, photographed, and removed for botanical analysis and for use as radiocarbon samples.

The site plow zone was mechanically removed following the completion of hand excavations using a Case farm tractor with an attached toothless bucket. All possible features were shovel scraped and troweled to define their shape in plan view. A map showing the location of all features was prepared using an alidade and plane table stationed over grid point N260E190.

Laboratory Methodology

All recovered archaeological materials were initially processed at the American Resources Group, Ltd., field laboratory in Sparta, Illinois. Material was separated into general categories (lithics, ceramics, botanical, unmodified rock, etc.), each of which contained more specific subcategories based on physical criteria. For example, the lithic subcatgories were bifaces, unifaces, debitage, other worked stone, and other (unmodified rock). Each of the subcategories was comprised of specific tool types with the debitage subcategory, for example, consisting of cores, primary and secondary flakes, interior flakes, angular shatter, and unidentified shatter. These tools were counted and weighed, and the information recorded on a preliminary analysis sheet. Following the preliminary analysis, the material in each of the general categories was forwarded to specialists for more detailed analyses. If these specialists detected errors in the preliminary analysis in any of these categories, the preliminary analysis sheet was corrected. The primary purpose of the preliminary analysis sheet was to provide a listing of general artifact types that could be used to examine the cultural affiliation of the pit features at an early stage in the analysis.

Flotation Processing Methods

During and after the completion of the field work, flotation samples were manually processed in the Sparta city reservoir using the tub agitation method (Struever 1968). Plant materials were skimmed from the surface of the water within the tubs using a fine mesh scoop and cataloged as the light fraction. The residue in the bottom of the screen (primarily lithic, ceramic, and faunal material) was designated the heavy fraction. Both fractions were placed on separate pieces of newspaper to dry. After drying, the botanical material was separated into maize, nutshell, seeds, and wood charcoal categories, with the material in each of these categories counted and weighed. The heavy fraction also was separated into categories--faunal, lithic, and ceramic--counted and weighed, and forwarded to specialists for analysis.

Thirty of the light fraction samples were forwarded to Dr. William Cremin of Western Michigan University for analysis. These samples were selected to provide a representative sample of the botanical contents of all feature types--structures, smudge pits, basins, and refuse pits--at the site. Specific analytical procedures used by Dr. Cremin in his analysis are contained in the botanical anlysis section of this report.

Lithic Analysis Methods

Prior to the final analysis of the Bonnie Creek site lithics, all materials had been washed, labeled, and sorted into basic categories: chipped stone tools, debitage, groundstone tools, and cracked rock.

Source Area Analysis. Chert types were identified on the basis of macroscopic characteristics (color, texture, inclusions, and form) with the assistance of a large chert type collection (Koldehoff 1986a). All chert types were quantified by weight to the nearest 0.5 g; descriptions of chert types are presented later in the report. Individual specimens too small to be accurately identified were placed in an indeterminate category along with specimens that were too ambiguous macroscopically to be typed.

It must be noted that most chert types that occur in Illinois and Missouri possess rather distinct macroscopic properties; however, a small percentage of many chert types exhibit a wide range of macroscopic characteristics which often overlap with the "typical" attributes of other chert types. During analysis, a problem of this nature was encountered in distinguishing Burlington chert from local glacial till cherts. This same problem has been encountered at other till plain sites (e.g., Billings 1983). The approach taken to this problem is discussed in Chapter V.

In addition to sourcing chert types, all groundstone tools and cracked rock were separated into raw material types such as igneous/metamorphic, sandstone, limestone, and limonite and were quantified by weight to the nearest 1.0 g.

Functional and Technological Analysis

Chipped Stone Tools. Chipped stone tools were separated into 11 categories, while debitage was separated into 9; both were quantified by count. Tools were identified on the basis of morphology and use wear. A 10 X hand lens was used to examine edges and surfaces for traces of use polish and damage. Admittedly, this method of analysis is less accurate and precise than approaches which employ high magnification (e.g., Keeley 1980). Data derived from previous experiments in biface and flake tool production and use were also utilized in the analysis (e.g., Koldehoff 1985a). A conservative approach to tool identification was taken due to the fact that most tools in the assemblage were simple flake tools, and a number of processes can create edge damage in addition to intentional use (e.g.,

trampling on living surfaces, spontaneous retouch during flake detachment, and trowel damage).

With regard to quantification of tools, individual specimens were placed in a category on the basis of their "apparent" primary function (e.g., generalized scraper) in order to record the total number of tools at the site. However, additional functions of each individual tool were also recorded to obtain a more precise measure of site activities. For example, if one flake had been used for both cutting and scraping tasks, both functions were recorded. Additional functions for certain tool types (bifaces, drills, and chert hammers) were not readily evident due to their formalized nature; thus, no attempt was made to record additional functions.

Tool and debitage categories are briefly described below, and each has specific implications for past human behavior. To enhance the description and interpretation of lithic industries, the chert types of certain tool and debitage categories (i.e., bifaces, microliths, hoe and adze resharpening flakes, cores, and formalized scrapers) were quantified by count and/or weight to the nearest 0.1 g.

Biface. A biface can be defined as a flake or cobble that has had multiple flakes removed from dorsal and ventral surfaces. Bilateral symmetry and a lenticular cross-section are common attributes; however, these attributes vary with the stages of production as do thickness and uniformity of the edge. Included in this category are all hafted and unhafted bifaces that function as projectile points and/or knives. This encompasses small, late prehistoric arrow points and larger darts and knives common in Archaic and Woodland assemblages. Hafted bifaces are highly formalized tools that were very portable and designed for maintenance and reuse. Arcnaic and Woodland specimens were especially designed for extended use and could be used to perform a variety of additional tasks, often with little or no modification.

Generalized Cutting Tool. Generalized cutting tool is defined as a flake tool or a portion of a flake tool edge used to perform a variety of cutting or sawing tasks. Use wear occurs on both sides of the edge due to the generally perpendicular direction at which the tool was used. Tool edges classified as generalized cutting usually possessed (1) a low edge angle; (2) a straight or slightly convex shape; and (3) retouching, when present, occurs on both sides of the edge.

Generalized Scraping Tool. Generalized scraping tool is defined as a flake tool or a portion of a flake tool edge used to perform a variety of scraping tasks. Tool edges classed as generalized scraping edges usually possessed (1) steep or high edge angles; (2) damage or polish on only one side of the edge; (3) edge shapes that were straight, slightly convex, or slightly concave; and (4) retouching, when present, occurs on only one face. Also quantified in this category are formalized scraping tools such as end scrapers.

Adze Flake and Fragment. Tools in this category are pieces of debitage or a tool fragment that exhibits traces of

woodworking polish that develops on chert after extended use. Adze flakes and fragments are the direct result of adze maintenance and recycling. Woodworking polish is dull or matte in appearance and tends to develop on high points like flake ridges before developing on the bottom of the flake scars (Keeley 1980). It is possible that some chipped stone adzes have had ther bits prepared by grinding the working edge smooth.

Spokeshave/Notch. A spokeshave is a specialized scraping edge that was prepared by retouching the edge of a flake. Its concave scraping edge indicates that it was used to work convex surfaces.

Denticulate. This tool type is based solely on a specific edge morphology--a serrated or toothed edge. This edge was produced by removing a series of appropriately spaced flakes from the edge of a flake. Several different functions have been suggested for this tool type or tool edge, including working hide, sawing wood, scaling fish, or shredding plant fibers. Its actual function remains problematical.

Graver. A graver is a small, often slender point that could be used to groove or incise a wide variety of material such as bone, shell, wood, or pottery. Gravers are easily manufactured by retouching the edge of a flake. Graver points were found to occur singly or in combination with other functional edges.

Macrodrill. A macrodrill is a relatively large (3-7 cm), slender biface used specifically for boring holes through a variety of materials. These formalized tools often possess haft modifications.

Microdrill. A microdrill is a small (1.0-3.5 cm), spike-shaped drill bit. These small tools were apparently hafted. Microwear analysis indicates these tools were specifically designed for drilling shell beads (Yerkes 1983).

Chert Hammer. A chert hammer is an exhausted core or cobble which exhibits heavy battering or crushing resulting from the production of groundstone tools. However, these tools could have been used to hammer or pound a variety of materials.

Hoe Flake and Fragment. This is a piece of debitage or tool fragment that exhibits traces of usually high-gloss use polish that commonly develops on hoe blades. Hoe flakes and fragments are the direct result of hoe maintenance and recycling.

Debitage

Core. A core is any cobble or piece of chert from which one or more flakes have been removed but which has not been shaped into a tool or used for a task other than that of a nucleus from which flakes have been struck. Three types of cores were identified in the analysis: freehand, bipolar, and microlith. Each type will be described below under the appropriate industry.

Decortication Flake. This is any flake or flake fragment that exhibits 50% or greater dorsal cortex and was not utilized as a tool.

Block Shatter. Block shatter is any angular or chunky fragment of chert that does not possess a platform or bulb of percussion. Angular fragments are usually the result of chert fracturing along inclusions or internal fracture planes caused by frost action or crustal deformation. Block shatter is also created when chert fractures as a result of burning (i.e., thermal shatter). Excluding burning, block shatter is most frequently produced during early biface reduction and in bipolar core reduction and is equivalent to Binford and Quimby's (1963:286) "primary shatter."

Flake Shatter. Flake shatter is any small (ca. 1.5 cm) fragment or splinter of chert that does not possess a platform or bulb of percussion and cannot be identified easily as a flake fragment. This debitage type is equivalent to Binford and Quimby's (1963:298) "secondary shatter," and it can be produced in any stage of a biface or core reduction sequence. However, it is generated in bipolar core reduction and late stage biface reduction most frequently. This category also encompasses small, thin fragments of thermal shatter.

Microblade. A microblade is a small (1.0-3.5 cm) blade struck from a prepared microlith core. Medial cross-sections of these blades are usually triangular or quadrilateral.

Core Reduction Flake. This is any flake that was struck from an unprepared core and was not converted into a tool. These flakes cannot be separated from flakes detached from early stage bifaces. Their platforms are usually amorphous in shape and lack multiple facets or lipping.

Biface Reduction Flake. This is any flake that was detached from a biface in middle or late stage reduction and was not converted into a tool. These flakes have multiple flake scars on their dorsal surface and multifaceted platforms that are usually well grounded, lipped, and elliptical in shape.

Groundstone Tools. Groundstone tools were separated into nine categories and quantified by count and weight to the nearest 1.0 g. These categories include both formalized and expedient tools which possess specific implications for past human behavior. Formalized groundstone tools (e.g., celts) were manufactured by pecking and grinding an igneous/metamorphic cobble into a desired shape. Expedient tools are cobbles used to perform a particular task with little to no prior modification. Cobbles were often selected for a task due to preexisting attributes (e.g., flat surfaces). These simple tools included manos, metates, hammers, etc.

All groundstone tools were quantified by their "apparent" primary function to record the number of tools in the assemblage. However, to obtain a more precise measure of site activity, all functional surfaces

and edges on expedient groundstone tools were recorded. For example, one cobble could possess two grinding surfaces, an anvil depression, and battering.

Mano/Grinding Stone. This is a roughly hand-sized cobble with one or more smoothed grinding surfaces. These tools (or small grinding surfaces) are used on conjunction with large grinding surfaces (i.e., metate/grinding slab) in the processing of plant foods.

Metate/Grinding Slab. This is a large cobble or tabular block of rock with at least one large grinding surface. These surfaces are used in conjunction with smaller hand-held surfaces to process plant foods.

Hammer. A hammer is a cobble which shows evidences of battering and crushing resulting from intentional use as a percussor. Hammers were most likely used in flint working, processing of plant foods (e.g., shelling nuts), and other tasks that involved crushing and pounding.

Anvil. An anvil is a cobble that has been used as a base to rest materials while they were struck with a hammer. Surfaces that are interpreted as anvils possess shallow, coarse textured depressions with amorphous outlines. These depressions were created by resistant materials wedging out minute granules of rock, and their appearance is similar to that of a surface that has been pecked with a chert hammer. Consequently, anvil depressions are believed to have been formed primarily by lithic reduction activities (i.e., bipolar percussion).

Celt. A celt is an ungrooved axe blade bifacially ground on one end to form a working edge (bit). These tools were usually hafted in wooden handles and normally used for cutting and working wood.

Pitted Stone. This is a cobble with at least one smoothed depression measuring no greater than 4 cm. These small depressions differ from anvils in that they are smoother and frequently deeper. It is likely that these depressions were used to crack, crush, and/or grind small amounts of less resistant material such as seeds, nuts, and mineral pigments. Infrequently, anvil type damage and smooth pits occur at the same location on a cobble surface.

Slotted Abrader. This is a tool predominantly manufactured from sandstone and used to shape and sharpen tools. Slotted abraders possess at least one groove or slot and often occur in combination with flat surface abraders.

Flat Surface Abraders. This abrader is usually a tabular shaped piece of sandstone with flat or slightly concaved surfaces. Common functions were apparently shaping and sharpening bone, wood, and possibly shell tools and ornaments as well as preparing platforms in flint working.

Sandstone Saw. This is a tabular piece of sandstone with

smoothed surfaces and one or more bifacially ground edges that form acute angles. These edges were apparently used in a perpendicular fashion to either abrade, groove, or sever resistant materials.

Cracked Rock. This category contains chunks and small fragments of rock (excluding chert) that were not culturally modified except for their highly fractured nature, which was apparently the result of repeated exposure to heat. These thermal fractured rocks are commonly interpreted as residue from the processing and preparation of foodstuffs. Cracked rock was divided into raw material types and quantified by weight to the nearest 1.0 g.

Ceramic Analysis

The goals of the ceramic analysis were to provide: (1) a description of all ceramic wares and their subtypes present at the site; (2) a description of the non-vessel ceramic artifacts (pottery trowel, etc.) at the site; (3) a comparison of the Bonnie Creek site ceramics with ceramic assemblages from sites in the project area and other parts of southern Illinois. Local comparisons were made using the ceramic assemblages from other Mississippian sites in the project area. Regional comparisons were made by using the published accounts of the ceramic assemblages from the Mike Adamson site (RI-188) in the Rend Lake reservoir area; the Bridges site in the Kaskaskia River valley; and the Julien and Turner and DeMange sites in the American Bottom.

The ceramic assemblage was separated into three types on the basis of temper, color, and mean sherd thickness. These were: Crab Orchard, Late Woodland, and Mississippian. The Crab Orchard and Late Woodland ceramic types were minority types (less than 1% of all ceramics at the site) that were recovered in small amounts from the site plow zone and the structure depression fills. These three types were divided into subtypes that encompass the entire range of surface treatments presently known for the Burning Star Mine #4 research area. These were:

Type 1: Crab Orchard
- 1a: Plain
- 1b: Cordmarked
- 1c: Fabric Impressed
- 1d: Residual

Type 2: Late Woodland
- 2a: Plain
- 2b: Cordmarked
- 2c: Residual

Type 3: Mississipian
- 3a: Plain
- 3b: Cordmarked
- 3c: Fabric Impressed
- 3d: Residual

In terms of the Crab Orchard ceramics, only the residual (Type 1d) subtype was present at the Bonnie Creek site. The residual category consists of sherds that are too fragmentary or eroded to determine the original surface treatment.

One hundred percent of the ceramic assemblage from the site was examined as to surface treatment and temper. Temper initially was used to sort the ceramic assemblage into two types, grit/grog tempered and shell tempered. Temper was systematically observed in terms of materials (shell or grit/grog), but the size or amount of the temper particles in each sherd was not systematically recorded. As a rule, the Crab Orchard sherds contained coarser temper with grit particles of much larger size than the grit particles comprising the temper in the Late Woodland ceramics. Limestone tempering, a characteristic associated with earlier Mississippian ceramics in the American Bottom region of Illinois, was not present in the Mississippian ceramics. The grit/grog tempered ceramics were further separated into two temporally distinct types, Crab Orchard and Late Woodland, on the basis of a combination of color, thickness, and temper size. Crab Orchard ceramics are generally thick, have a distinct orange to buff exterior, and are densely tempered with large pieces of grit, chert, and grog. Surfaces are smoothed plain, cordmarked, or fabric marked. Late Woodland ceramics are thinner, have buff to black exteriors, and have cordmarked or plain exterior surfaces.

Vessel wall thicknesses were obtained by measuring all of the grit-tempered sherds and by measuring all shell-tempered sherds with a diameter of 10 mm or greater from a pit feature context. Vessel wall thickness was determined on the basis of two measurements taken on the thinnest and thickest points of each sherd. Hand calipers accurate to 0.1 mm were used to obtain these measurements.

One hundred percent of the sherds from the site were examined to identify surface treatment. Surface treatment throughout the till plains is very simple, with only three surface treatments recognized: (1) cordmarking; (2) fabric marking; (3) smoothed/plain. Cordmarked, fabric marked, and smoothed surfaces occur on Crab Orchard vessels (Maxwell 1951; Stephens 1975); cordmarking on Late Woodland vessels (Holley n.d.); and cordmarking, fabric marking, and smoothed surfaces on Mississippian vessels. Decorations were restricted to the Mississippian assemblage and consisted of incised lines on plates.

Vessel Types. The Mississippian ceramic assemblage was sorted into sherd types using the point of origin of the sherd on the vessel as a criterion. Four sherd types were defined: rims (vessel lip present); necks (decoration, recurvature, or part of the vessel shoulder present); body (thin undecorated sherds); and basal (thick sherds exhibiting abrasion or wear). Rim and neck sherds were used to define the ceramic vessel types contained within each wear type. The correct orientation for each rim was determined by placing the sherd against a horizontal surface and manipulating the sherd until the sherd was flush with the horizontal surface. The resultant rim profiles revealed that jars, bowls, plates, and pans were present. The following criteria developed

by Holley (n.d.) were used to define the vessel type present at the site:

Jars. These are defined as globular bodied vessels with incurved or recurved rims. Traditionally, the jar form is assumed to be at least two times higher than it is wide with the maximum diameter occurring below the vessel orifice. Recurved jars have a constricted neck that is smaller in diameter than the vessel orifice which has a slightly flaring to flaring rim. On incurved jars, the maximum upper vessel diameter occurs at the neck/shoulder junction. The vessel walls steadily converge from this point with the minimum upper vessel diameter occurring at the vessel orifice, which has an inward curving rim.

Bowls and Pans. These vessel types are not as high as jars and achieve their maximum vessel diameter at the vessel orifice. Rounded bowls are defined as hemispherical in profile view while incurved bowls approximate 3/4 of a sphere and have an inward curving rim. Pans are very shallow large diameter vessels. Because of the fragmentary nature of many of the ceramics from the site, it was often not possible to determine if the recovered rims were from a bowl or pan form.

Plates. Plates are characteristic of late (Moorehead and Sand Prairie phase) ceramic assemblages in the American Bottom. Plates are shallow bodied vessels with distinctive tilted rims. Similar to bowls and pans, the maximum vessel diameter occurs at the orifice. Because of the small size of the majority of the ceramics, it was not always possible to determine if a rim was from a shallow bowl or plate.

CHAPTER III. FIELD INVESTIGATIONS

Mark J. Wagner and Mary R. McCorvie

The Bonnie Creek site was initially located by Pulcher (1974a). The site was revisited by an archaeological crew in 1979 as part of the survey of the Northfield extension of the Burning Star Mine #4 (Haas and McNerney 1980:156). The site was defined as a light scatter of chert and glacial cobbles covering a 10,500 m^2 area in a disced field with 80% visibility. The artifact inventory consisted of one biface, one shell-tempered rim sherd, and three cordmarked Late Woodland body sherds (Haas and McNerney 1980:156). The site was included within the sample of 32 sites scheduled for mitigation, and Phase II test excavations were recommended (Haas and McNerney 1980:374-378).

Hand Excavations

Phase II excavations were conducted at the site in the early summer of 1983. At that time, the site was located in a fallow agricultural field with 0% ground surface visibility. Because of the poor ground surface visibility and difficulties in acquiring the services of a farmer to plow the site, a controlled surface collection was not conducted. Instead, the site limits were defined by systematically excavating thirty six 50 cm x 50 cm units across the ridge (Figure 7;Table 5). The excavations started at the south end of the field 10 m north of the site datum (N200E200) with units excavated every 10 m. In all, five north-south transects of units covering a maximum area of 90 m north-south by 40 m east-west were excavated parallel to the ridge edge. Cultural material was recovered from 26 of the 36 units; the artifact frequency ranged from 1 to 38 pieces with a mean of 4.1 artifacts per unit. Only two soil horizons were defined in the unit wall profiles: (1) a dark yellowish brown 10YR 3/4, 4/4, 4/3 silty clay plow zone that varied in depth from 18 to 28 cms bs. This level contained the majority of the cultural material found in the units; and (2) a 10YR 6/6 yellowish brown clay subsoil that originated at the base of the plow zone. A small amount of cultural material was recovered from within this layer; but in all cases, this material appears to have been redeposited by root and rodent disturbances.

The units containing cultural material were restricted to an approximate 60 m north-south by 40 m east-west area adjacent to the bluff edge. Three of the units (14, N260E190; 29, N260E170; and 34, N280E180) contained a much higher frequency of cultural material than the other units, with a mean artifact frequency of 26.6 pieces per unit.

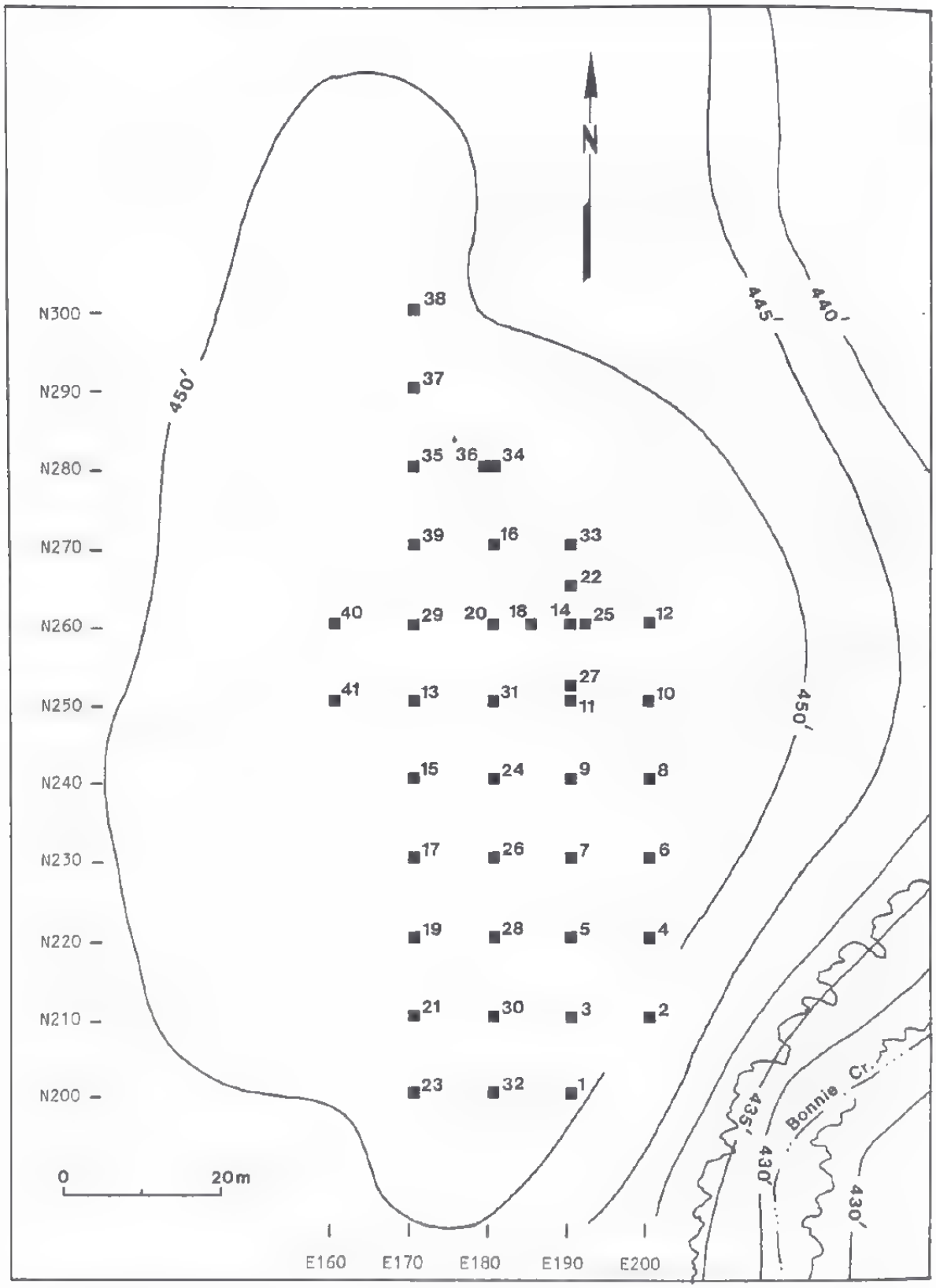


Figure 7. .25m² test unit distribution, Bonnie Creek site.

Table 5. Material Frequencies. .25 m^2 Units.

Unit	Chert Debitage	Chert Tools	Ceramics	Burned Clay	Rock	Fauna	Total	(%)
1 (N200E190)								
2 (N210E200)					1		1	(0.6)
3 (N210E190)								
4 (N220E200)								
5 (N220E190)								
6 (N230E200)					2		2	(1.1)
7 (N230E190)					1		1	(0.6)
8 (N240E200)					1		1	(0.6)
9 (N240E190)		1			2		3	(1.7)
10 (N250E200)					3		3	(1.7)
11 (N250E190)	2		3		1		6	(3.4)
12 (N260E200					1		1	(0.6)
13 (N250E170)	1		4	8		4	17	(9.6)
14 (N260E190)	4	1			4		9	(5.0)
15 (N240E170)					1		1	(0.6)
16 (N270E180)					3		3	(1.7)
17 (N230E170)	1	1	1		1		4	(2.3)
18 (N280E185)	4		6	3	2		15	(8.5)
19 (N220E170)	1						1	(0.6)
20 (N260E180)	1		3		2		6	(3.4)
21 (N210E170)								
22 (N265E190)	1	1	1		1		4	(2.3)
23 (N200E170)								
24 (N240E180)			1		3		4	(2.3)
25 (N260E191)	4		1		4		9	(5.1)
26 (N230E180)								
27 (N261E190)					1		1	(0.6)
28 (N220E180)					3		3	(1.7)
29 (N260E170)	5		9	1	4		19	(10.7)
30 (N210E180)								
31 (N250E180)		3	4		1	6	14	(7.9)
32 (N210E180)								
33 (N270E190)								
34 (N280E180)	2	2	13	2	12	7	38	(21.5)
35 (N280E170)								
36 (N280E179.5)					3		3	(1.7)
37 (N290E170)					1		1	(0.6)
38 (N260E170)	1				3		4	(2.3)
39 (N270E170)					2		2	(1.1)
40 (N260E160)								
41 (N260E160)	1						1	(0.6)
Total	28	9	46	14	63	17	177	
%	15.8	5.0	26.0	7.9	35.6	9.6		

In addition, a prehistoric feature (feature 1) was encountered at the base of the plow zone in unit 14. Feature 1 was defined as a layer of burned red soil, ash, and charcoal fragments that completely covered the base of the plow zone. Shell-tempered sherds and chert flakes were present on the surface of the feature. The unit was expanded into a 1 m^2 unit, and then into a 2 m^2 unit, with the feature still covering the entire base of the unit. At this point, feature 1 was recognized as the floor of a burned Mississippian structure. Additional units were excavated to the north (unit 22, N265E190) and west (unit 44, N260E183) of the feature to define the limits of the structure. The eastern limits of the structure were already defined by the ridge spur edge and the presence of typical plow zone/subsoil horizons in unit 12 (N260E100). The burned structure floor was not present in the northern unit (22), but features interpreted as Mississippian wall trenches were found in the east and west wall profiles of the unit. The western unit (44) also did not encounter the burned structure floor, and the unit was expanded to 4 m^2, at which point the edge of the structure floor was encountered along the western edge of the unit. Similar to the structure floor in unit 14, this section of the floor consisted of gray ash and areas of dark burned soil. Unlike unit 14, however, large pieces of charred poles were found both in the plow zone and on the structure floor, indicating that sections of the burned structure framework were still intact. As a result, rather than mechanically removing the plow zone above the structure and possibly destroying the remains of the structure framework, an excavation block was created above the structure and the plow zone removed by hand without screening. This excavation block (block A) was roughly rectangular, with a maximum east-west length of 9.0 m and a maximum east-west width of 8.0 m (Figure 8). This was sufficient to completely define the limits of the structure (designated Structural Complex 1), which appeared as a rectangular gray ashy stain with both small and large diameter poles located along the western edge of the stain. The stain measured 6.8 m east-west by 6.4 m north-south (43.52 m^2). Other features were not found within the excavation block. Hand-stripping of the structural complex revealed that two separate overlapping structures (Structures 1a and 1b) were present. A detailed description of Structural Complex 1 is presented later in this chapter.

Following the excavation of the 50 cm^2 units and concurrent with the excavation of block A, three transects of 4 m^2 units were excavated across the site (Figure 8). The purpose of these units was to provide a larger screened sample of the site contents and to obtain information regarding feature location at the site. Twelve units were excavated for a 2% excavation sample of the site area as defined by the 50 cm^2 units. Ten of these units encompassed the 50 cm^2 test units as their southwest corner while the two most northern units (54, N278E170 and 42, N278E180) were full 4 m^2 units. A total of 910 pieces of material (Table 6) was recovered from these units with a mean frequency of 75.8 artifacts per unit. Three units (51, N260E170; 43, N260E180; 42, N278E180) had artifact frequencies higher than the mean. Two of these (units 43 and 51) were located in the the site center east of Structural Complex 1, while unit 42 was located at the northern end of the site (Figure 8). Unit 42 contained 88.0 % (n=95) of the faunal material and 30.3% of all material recovered from the larger units. The high frequency of

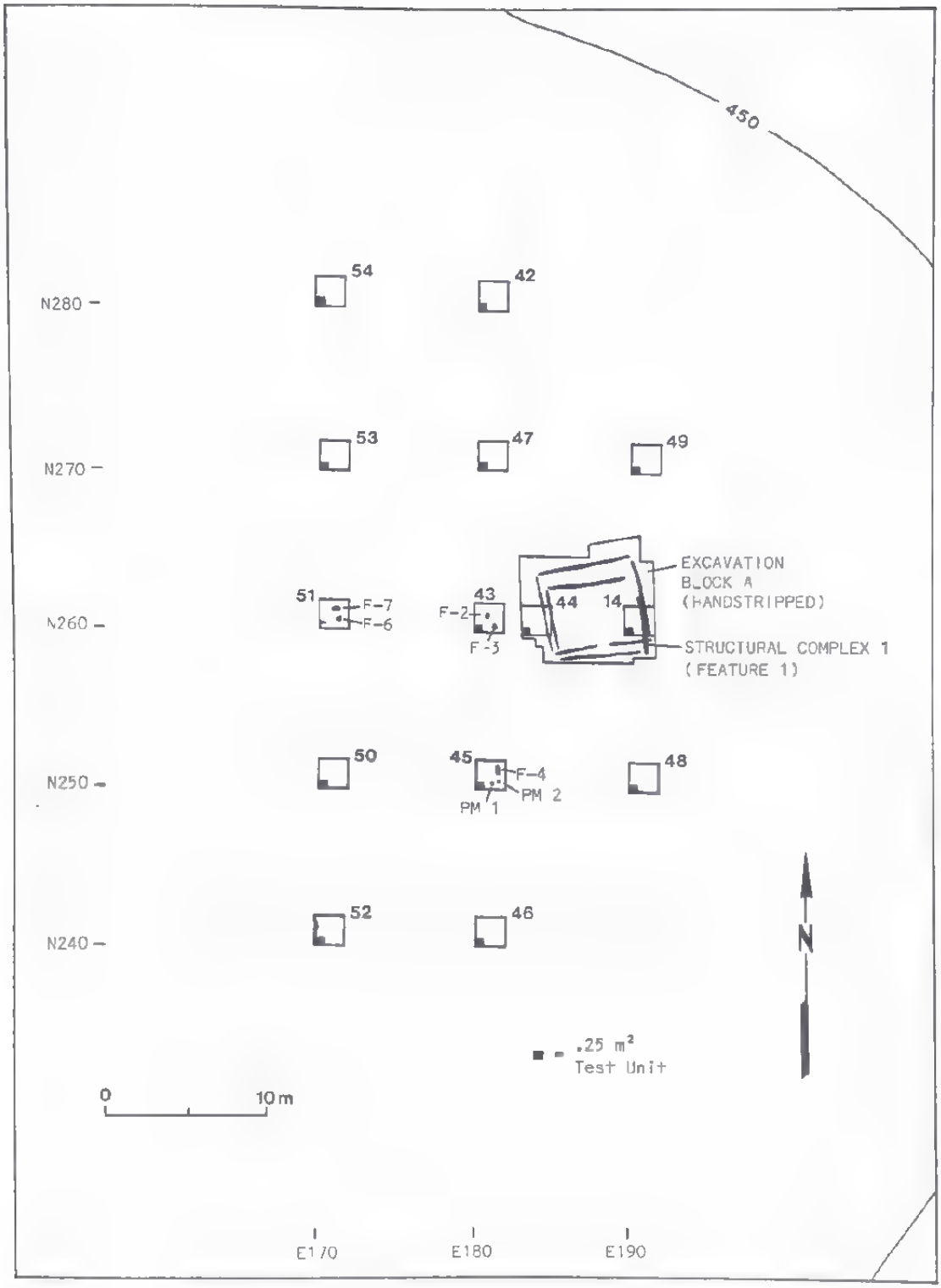


Figure 8. Location of 4 m^2 units and excavation block A, Bonnie Creek site.

Table 6. Material Frequencies, 4 m^2 Units.

Unit	Chert Debitage	Chert Tools	-Ceramics- Shell/Grit	Burned Clay	Rock	Fauna	Total	%
42 (N280E180)	15	8	91	13	54	95	276	(30.3)
43 (N260E180)	18	6	29 / 1	14	45	1	114	(12.5)
44 (N260E183)	10	15	16	8	45	1	95	(18.6)
45 (N250E180)	13	3	4		16	4	40	(3.5)
46 (N240E180)	5		22 / 1	1	33	5	67	(13.0)
47 (N270E180)	4	4	11 / 2		14	2	37	(4.1)
48 (N250E190)	2	2			1		5	(0.5)
49 (N270E190)	4	1		1	5		11	(1.2)
50 (N250E170)	7	4	13	2	15		41	(4.5)
51 (N260E170)	20	2	42	5	19		88	(9.7)
52 (N240E170)	10	1	3	7	16		37	(4.7)
53 (N270E170)	20	2	10	3	39		74	(8.1)
54 (N280E170)	3	3	1		18		25	(2.7)
Total	131	51	242 4	54	320	108	910	
%	14.4	5.6	26.6 0.4	5.9	35.2	11.9		

material--particularly animal bone--within this unit together with its location at the edge of the site suggested that a midden area might be located at the northern site end. However, the soil profiles were similar to those of the other excavation units at the site, with only a 10YR 3/6 dark yellowish brown silty clay plow zone (0-20 cm bs) and 10YR 4/6 dark yellowish brown silty clay subsoil present. No features were defined.

The profiles of the remainder of the large excavation units were very similar to those of unit 42. The plow zones ranged from a 10YR 3/6 to 10YR 4/4 dark yellowish brown silty clay and varied in thickness from 24 to 30 cm. Subplow zone cultural horizons were not defined in any of the units with a 10YR 4/6 to 5/4 dark yellowish brown culturally sterile subsoil originating at the base of the plow zone in all units.

Prehistoric features were defined at the base of the plow zone in units 43, 45, and 51 located to the west and southwest of Structural Complex 1 (Figure 8). Unit 43 contained a smudge pit (feature 2) and a shallow basin containing five shell-tempered sherds (feature 3), both of which originated at the base of the plow zone. Unit 45 contained a smudge pit (feature 4) and two post molds (post molds 1 and 2), which again originated at the base of the plow zone. Finally, a large post (feature 6) and a deep basin (feature 7) were found in unit 51. All of these features are described later in this chapter. Other features were not defined in the units. After the plow zone had been removed from the entire site, it was found that a stain in unit 51 originally interpreted as a disturbance was in fact the very terminus of a Mississippian wall trench (feature 70) associated with a second group of structures.

In sum, the controlled excavations revealed that: (1) the site covered approximately 2,400 m^2 of the ridge spur with two areas of high artifact frequency, one in the site center and one at the northern end; (2) Mississippian structures and features were present in the site center immediately beneath the plow zone; and (3) Late Woodland artifacts formed a very minor part of the assemblage, with 98.7% (n=308) of the recovered ceramics being Mississippian. This, together with the feature data, suggested that the Bonnie Creek site was a relatively "pure" Mississippian site with little evidence of earlier occupations. Although Misissippian occupations had been identified at other sites in the project area such as the Galum Crossing (21C4-29) and Lightfoot (21C4-35) sites, these were multicomponent sites at which Late Woodland occupations also were present and the Mississippian community pattern was unclear. Total excavation of the Bonnie Creek site through the mechanical removal of the plow zone would provide an opportunity to examine Mississippian community patterns in the upper Galum Creek valley in a relatively unmixed context. Because the Bonnie Creek site was scheduled for destruction by mining in 1984, it was decided to proceed with final mitigation activities immediately following the completion of test excavations at other prehistoric sites in the mine area.

Mechanical Excavations

The plow zone was removed from the Bonnie Creek site in late June 1983 using a Case farm tractor with an attached toothless bucket (Figure 9). The tractor operator was able to cut a clean enough surface that shovel scraping was unnecessary. The stripping operations revealed that the Bonnie Creek site was an almost pure Mississippian occupation with no earlier pit features or structures present. The site plan consisted of two structural complexes, comprised of overlapping structures that flanked an approximate 300 m^2 central area containing 37 pit features including smudge pits, refuse-filled basins, and possible cooking pits (Figure 10). A small midden remnant and the disturbed grave of an adult male were located slightly downslope and approximately 10 m north of the main site area (Figure 10). The midden measured approximately 40 m^2 but was probably larger at one time, as the grave (feature 30; burial 1) was located southeast of the small midden area but was filled with midden debris. This suggests that the grave was excavated through a section of the site midden which later was destroyed by farming and erosion. Another indication that the midden was larger at one time was that the excavation unit (42) with the highest artifact frequency was located approximately 5 m east of the midden remnant. All of this material was contained in the unit plow zone, which suggests that this was plowed up midden. Faunal, ceramic, and lithic material was recovered from unit 42 (Table 6). One smudge pit (feature 53) also was located in this area.

The pit features near the structures formed a roughly circular pattern with an open area in the south part of the circle. Five feature clusters were discernible within this pattern. A group of four pit features (features 32, 33, 34, 80) was located southeast of Structural Complex 2 and was interpreted as being primarily associated with this group of structures. Similarly, a group of eight pit features (features

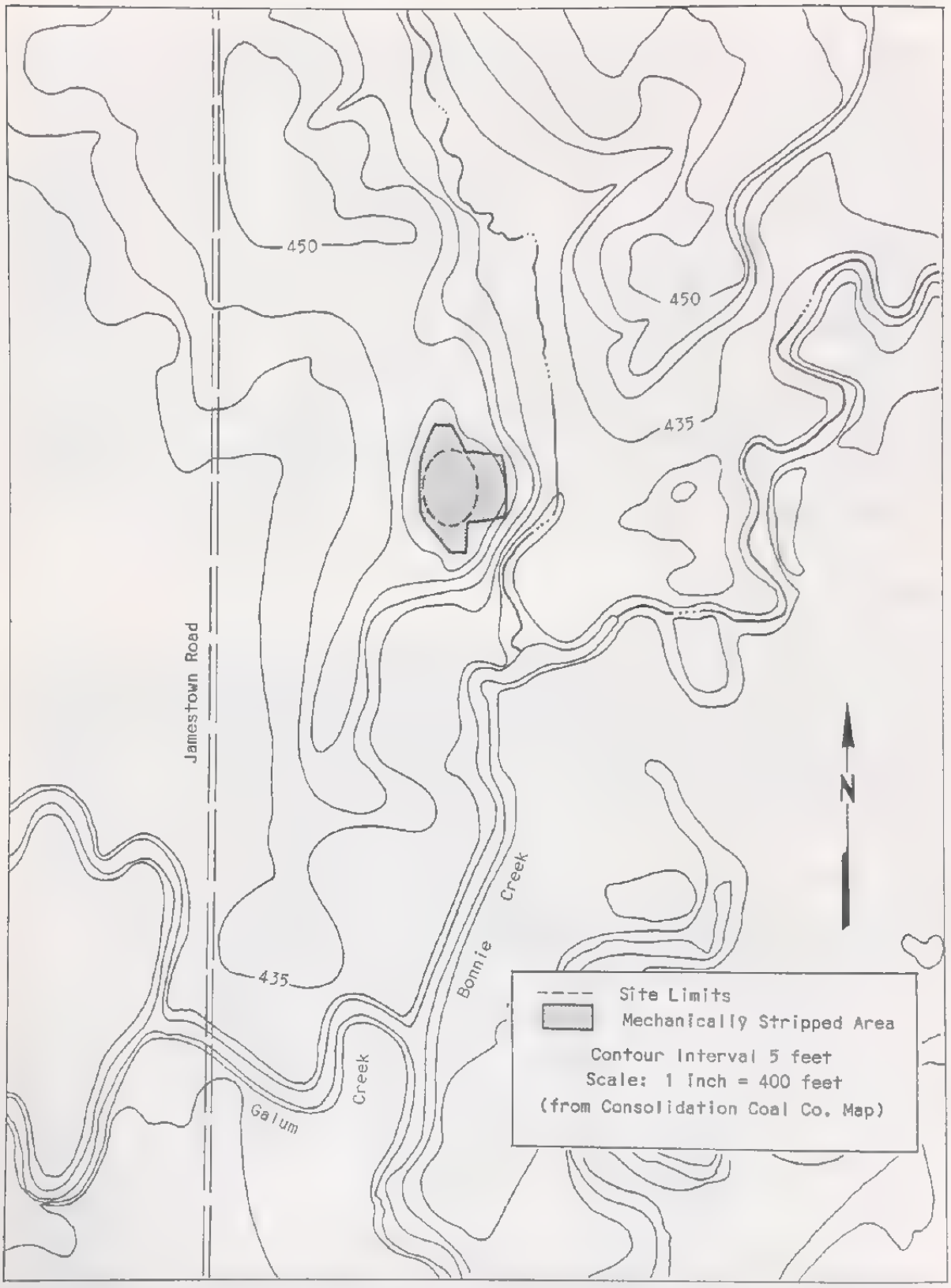


Figure 9. Mechanically stripped area, Bonnie Creek site.

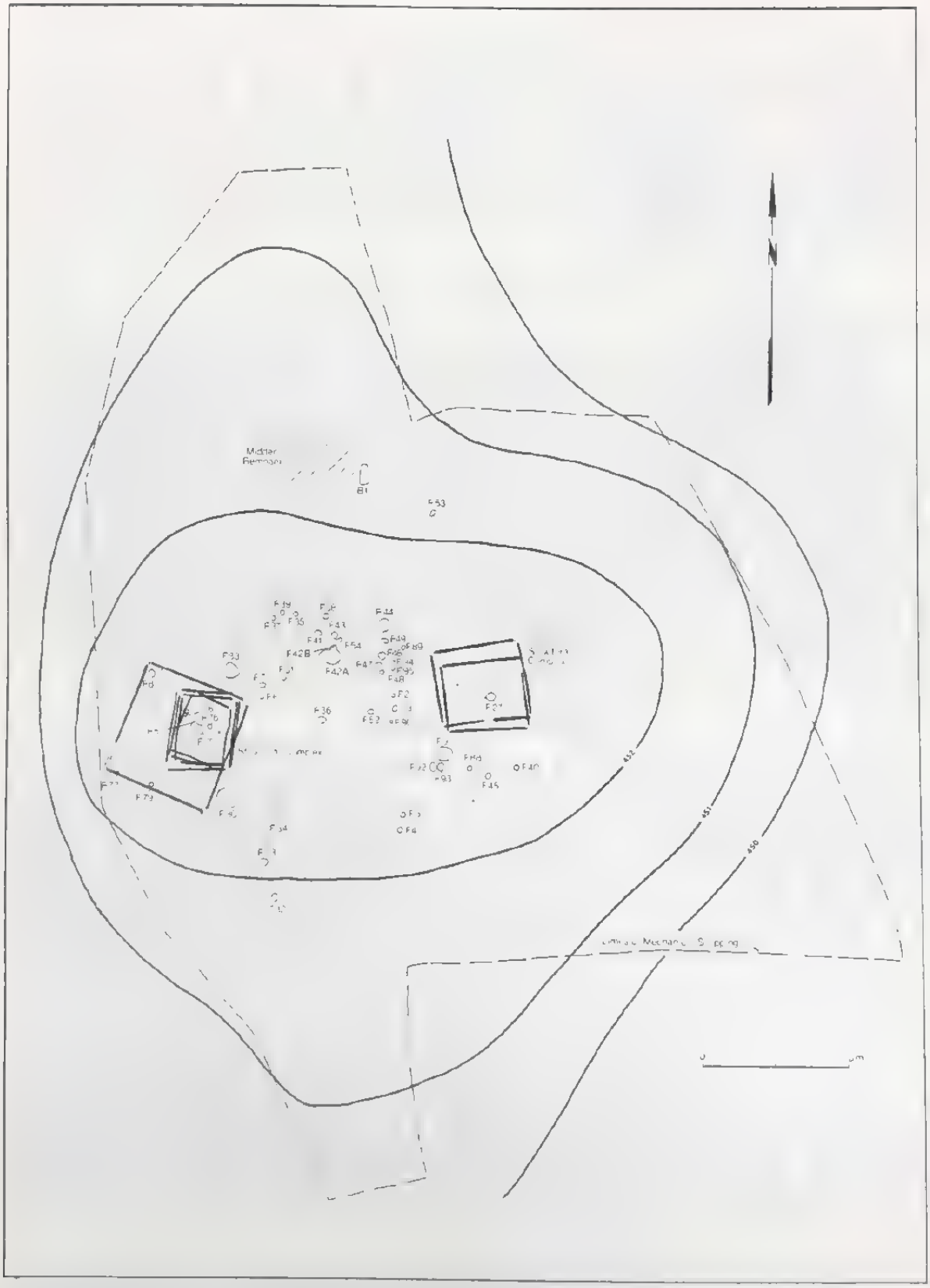


Figure 10. Site plan, Bonnie Creek site.

4, 40, 45, 51, 88, 91-93) located south of Structural Complex 2 was interpreted as being associated with this complex. A third group of pit features (features 2, 3, 44, 46, 47-49, 52, 89, 93-95) was located west and northwest of Structural Complex 1. Slightly to the west of this cluster and possibly associated with it was a fourth cluster of eight features (features 35, 37-39, 41-43, 54). Finally, a group of three pit features (features 7, 31, 83) and a possible large post (feature 6) were located adjacent to and northeast of Structural Complex 2 and may be associated with this complex.

Structure Descriptions

Two structural complexes containing a total of seven building episodes were defined at the Bonnie Creek site (Figure 10). Structural Complex 1 was located on the eastern site margin overlooking the Bonnie Creek floodplain and consisted of two building episodes representing two structures (Structures 1a and 1b) (Figure 11). Structural Complex 2 was located on the western site margin and consisted of five building episodes (Structures 2a-e) representing at least two, and possibly as many as five, separate structures. The structural complexes were located 13.5 m apart with pit feature clusters located between the two complexes. This arrangement suggests that some of the building episodes in the two structural complexes were contemporary and that the Mississippian community pattern at the site may have consisted of a central work area flanked to the east and west by structures.

Structural Complex 1

Structural Complex 1 was identified during the initial test excavations when a 50 cm^2 test unit (14, N260E190) intersected the burned floor of Structure 1b at the base of the plow zone. As previously described, additional units were excavated to find the margins of the structure. The discovery of burned poles in association with the structure led to a decision to hand-strip the structure to recover as much detail as possible. An excavation block (block A) was created over the structure, and the plow zone was removed without screening. After the excavation block had been cleared to the base of the plow zone, a grid of 4 m^2 units was superimposed over the block, which was then troweled and photographed (Figure 12). Each unit was excavated in arbitrary 5 cm levels with all structural elements mapped, photographed, and removed. The fill from the units was screened through 1/4 in. mesh with a 10 liter flotation sample taken from each level. Artifacts were pieceplotted whenever possible. All discolored floor areas, wall and roof poles, and wall trenches were assigned feature numbers. Post molds within the wall trenches and structures were cross sectioned, mapped, and photographed on a selective basis.

Structure 1a. Structure 1a was the earlier of the two rectangular structures comprising Structural Complex 1 (Figure 11). The structure was comprised of four wall trenches (features 11, 20, 22, 29) and had maximum exterior dimensions of 6.1 m east-west by 5.25 m north-south (32.0 m^2) (Table 7). The interior floor area measured 5.5 m by 4.9 m

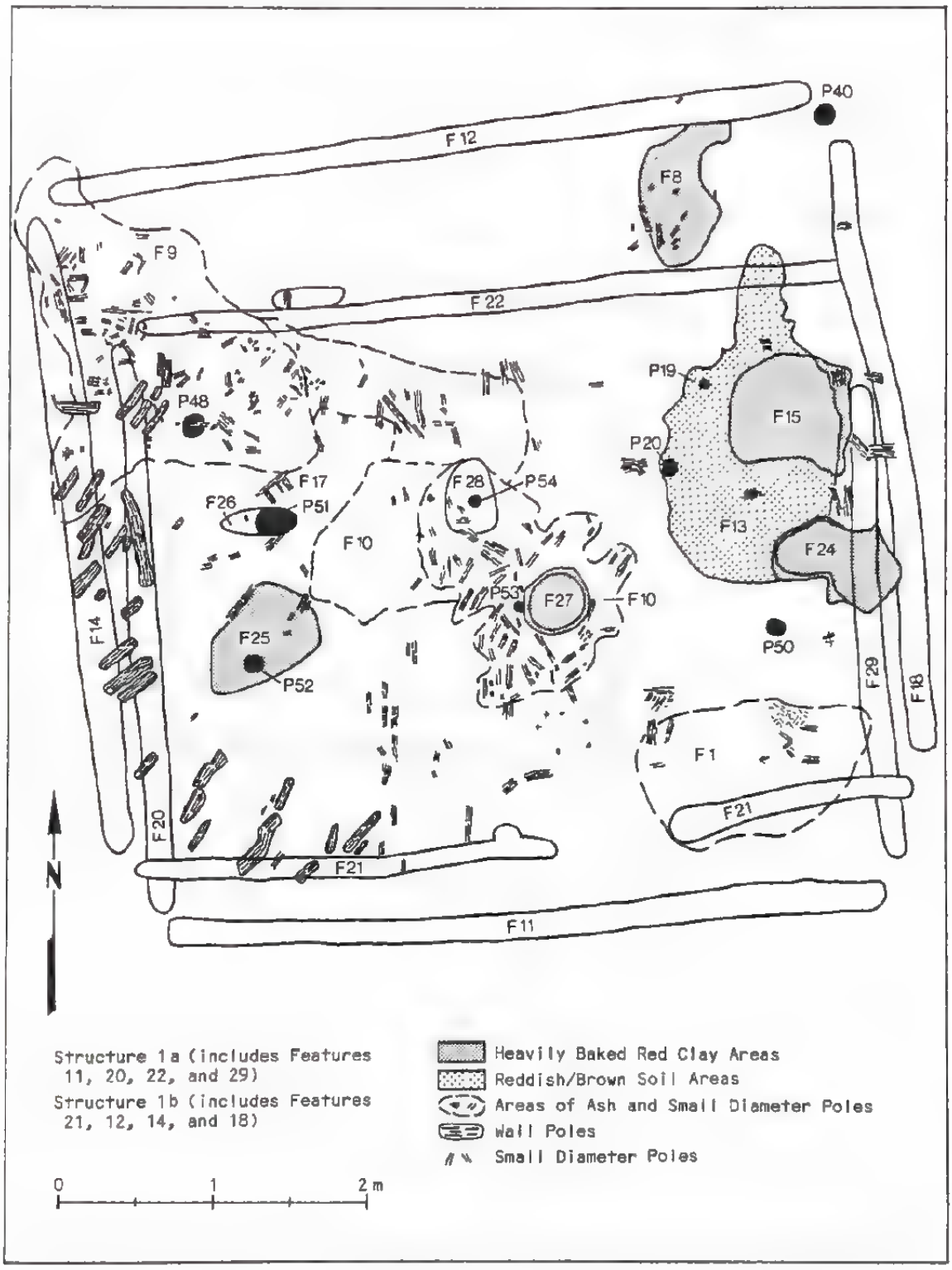


Figure 11. Structural Complex 1 (Structures 1a and 1b).

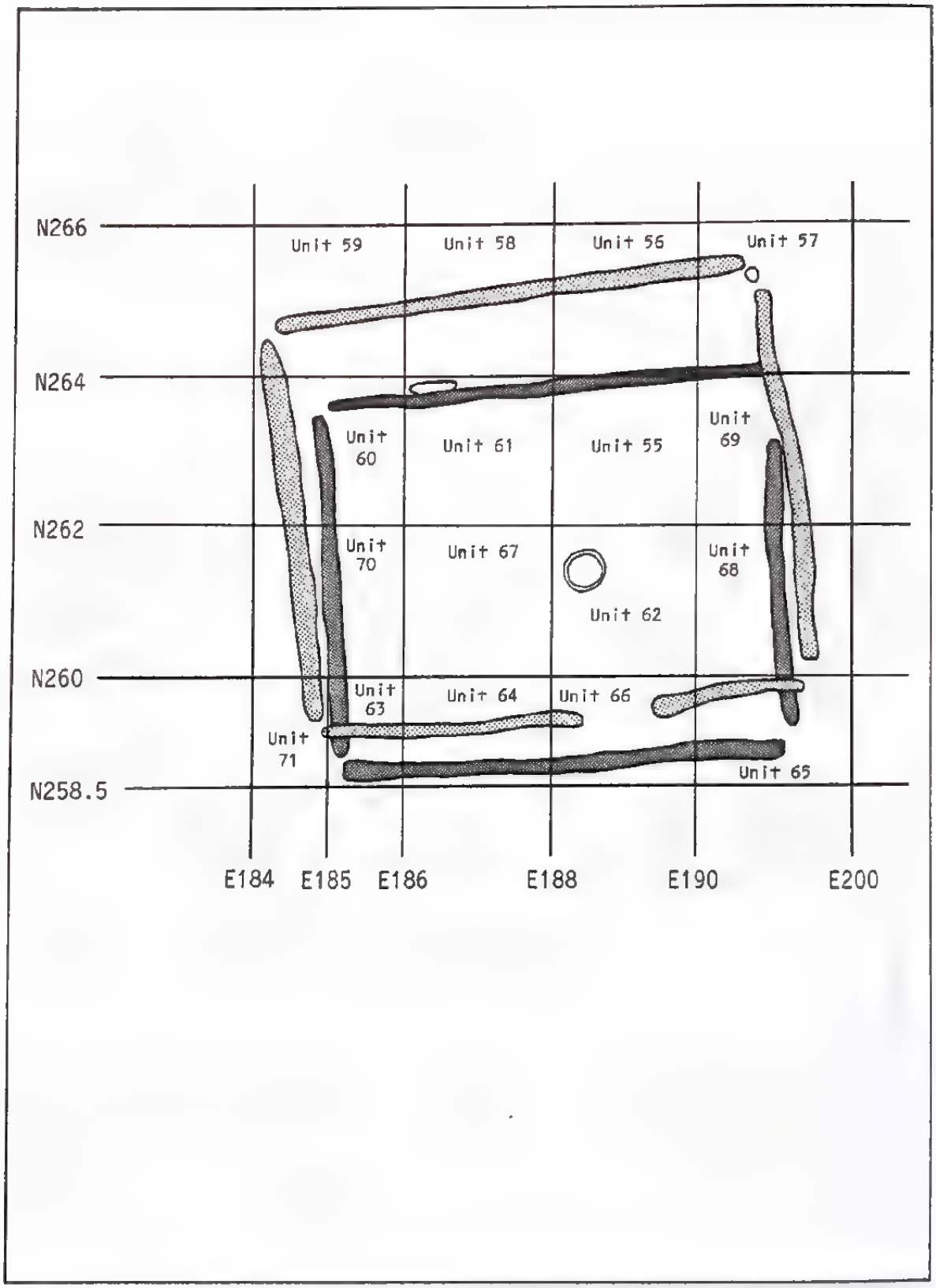


Figure 12. Excavation units, Structural Complex 1.

Table 7. Structural Complex 1 Measurements.

Measurements (m)	Structure 1A	Structure 1B
Exterior Length	6.10	7.00
Interior Length	5.50	5.75
Exterior Width	5.25	6.00
Interior Width	4.90	4.90
Maximum Area	32.00 m^2	42.00 m^2
Interior Floor Area	26.95 m^2	28.20 m^2
Orientation of Long Axis	E-W	E-W
Radiocarbon Date		Unadjusted:AD 1330±50 Adjusted:AD 1302±30

(26.95 m^2). All four corners of the structure were open, with a post mold (post mold 40) closing the gap between the north and west wall trenches. Post molds were not found in the other corners. A 90 cm gap existed between the northern and eastern wall trenches. Post molds were not found within the gap, indicating that it may represent an entranceway into the structure. Data regarding the Structure 1a wall trenches is summarized in Tables 8 and 9. The depth of the wall trenches varied, with the north wall trench having the greatest depth (93 cm).

Structure 1a was largely destroyed by the later construction of Structure 1b. Internal features, post molds, or artifacts could not be definitely associated with the structure. A 1.15 m north-south by 5.5 m east-west (6.3 m^2) area along the northern wall of the structure extended out from beneath Structure 1b, but no structure floor or artifacts were found within this area.

Structure 1b. Structure 1b was a rectangular structure oriented in the same direction as Structure 1a (Figure 11). It may represent an enlargement of this earlier structure. This does not represent a rebuilding of Structure 1a in the sense of digging new trenches around the original structure and expanding it in size. It may indeed represent a rebuilding episode, but the new structure (1b) was constructed slightly north of the original structure with its wall trenches excavated through the north, west, and east wall trenches of Structure 1a. Structure 1b was comprised of four wall trenches (features 12, 14,

Table 8. Wall Trench Data, Structural Complex 1.

	Length (m)	Maximum Width (cm)	Depth (cm)	Munsell Color (10YR)	Shape	Inclusions
Structure 1A						
Feature 11	5.95	22	25	3/4	Straight side, round bottom	Charcoal flecks
Feature 20	3.85	30	18	3/4 to 4/4	Straight side, round bottom	Charcoal flecks
Feature 22	4.65+	15	93	4/4	Straight side, round bottom	Charcoal flecks, burned clay
Feature 29	3.18	15	23	3/4 to 4/4	Straight side, round bottom	Charcoal flecks
Structure 1B						
Feature 12	6.00	20	50	3/4	Straight side, round bottom	Charcoal flecks
Feature 14	5.50	20	20	3/4	Straight side, round bottom	Charcoal flecks
Feature 18	5.00	20	26	3/4	Straight side, round bottom	Charcoal flecks
Feature 21	5.21	17	46	3/4	Straight side, round bottom	Charcoal flecks, burned clay

18, 21), had maximum exterior dimensions of 7.0 m east-west by 6.0 m north-south (42 m^2), and an interior floor area measuring 5.75 m by 4.9 m (28.2 m^2). Similar to Structure 1a, Structure 1b had a gap in one of the wall trenches that could represent an entranceway into the structure. This gap measured 95 cm wide and was located along the southern wall (feature 21) of the structure. Unlike the possible entranceway associated with Structure 1a, which was located in a corner of the structure, the Structure 1b entranceway is located approximately 2.0 m from the nearest opposing wall trench (feature 29 to the east).

Structure 1b was a burned Mississippian structure that had not been seriously disturbed by farming. A large amount of structural detail including charred poles, internal features, and post molds was associated with the structure. During the clearing of the excavation block, the discovery of large amounts of burned wood in the plow zone in the northwestern part of the block indicated that the poles along the north wall trench had been destroyed by plowing. When the block was cleared to the base of the plow zone, Structure 1b appeared as a rectangular stain covered by gray and white ash (Figure 13). Concentrations of small diameter poles were present within the northwestern corner and the center of the structure. Larger diameter

Table 9. Post Molds, Structural Complex 1 Wall Trenches.

Post Mold	Location	Diameter (cm)	Depth (cm)	Munsell Color (10YR)	Inclusions	Shape
3	Feature 11	10	14	3/4	Charcoal	Straight side, round bottom
4	Feature 11	10	18	3/4	Charcoal	Straight side, round bottom
5	Feature 11	9	18	3/4	Charcoal	Straight side, round bottom
6	Feature 11	9	17	3/4	Charcoal	Straight side, round bottom
7	Feature 11	15	20	3/3	Charcoal	Straight side, round bottom
8	Feature 11	12	20	4/4	Charcoal, burned clay	Sloping side, round bottom
9	Feature 11	14	18	4/4	Charcoal	Sloping side, round bottom
10	Feature 11	11	19	4/4	Charcoal, burned clay	Sloping side, flat bottom
11	Feature 11	10	20	4/4		Straight side, round bottom
12	Feature 11	13	22	4/4	Charcoal, burned clay	Straight side, round bottom
13	Feature 11	8	15	4/4	Charcoal, burned clay	Straight side, round bottom
14	Feature 11	11	19	4/4	Charcoal	Straight side, flat bottom
15	Feature 11	11	21	4/4	Charcoal	Straight side, round bottom
16	Feature 11	12	14	4/4	Charcoal	Straight side, round bottom
17	Feature 11	16	9	5/6	Charcoal	Straight side, round bottom
18	Feature 11	10	5	4/4		Sloping side, round bottom
21	Feature 11	11	10	4/4	Charcoal	Straight side, round bottom
22	Feature 11	10	14	4/4	Charcoal, burned clay	Straight side, round bottom
23	Feature 11	12	14	4/4	Charcoal	Straight side, pointed bottom
24	Feature 11	11	15	4/4	Charcoal	Straight side, round bottom
25	Feature 11	11	16	4/4	Charcoal, burned clay	Straight side, round bottom
26	Feature 11	13	3	5/6	Charcoal	Round bottom
27	Feature 11	13	4	5/6	Charcoal, burned clay	Flat bottom

Table 9. (cont'd).

Post Mold	Location	Diameter (cm)	Depth (cm)	Munsell Color (10YR)	Inclusions	Shape
28	Feature 11	13	6	5/6	Charcoal	Round bottom
29	Feature 11	11	12	4/4	Charcoal, burned clay	Straight side, flat bottom
30	Feature 11	7	8	4/4	Charcoal, burned clay	Straight side, round bottom
31	Feature 11	16	10	4/4	Charcoal	Straight side, pointed bottom
32	Feature 11	13	9	3/6	Calcined bone	Straight side, round bottom
33	Feature 11	11	12	3/6	Charcoal	Straight side, round bottom
34	Feature 11	10	10	3/6	Charcoal	Straight side, round bottom
35	Feature 11	13	13	4/4	Charcoal, burned clay	Straight side, round bottom
36	Feature 11	12	11	4/4	Charcoal, burned clay	Straight side, flat bottom
37	Feature 11	13	5	4/4	Charcoal	Straight side, round bottom
38	Feature 11	10	13	4/4	Charcoal, burned clay	Straight side, pointed bottom
39	Feature 11	12	13	4/4		Straight side, round bottom
40	Feature 12	11	12	4/6		Straight side, round bottom
41	Feature 12	11	11	4/6	Charcoal	Straight side, round bottom
42	Feature 12	13	35	4/4		Straight side, round bottom
43	Feature 12	13	9	4/4	Charcoal, burned clay	Straight side, round bottom
44	Feature 12	10	20	4/6	Charcoal	Straight side, round bottom
45	Feature 12	12	17	4/4	Charcoal, bone flecks	Straight side, flat bottom
46	Feature 12	6	9	5/6	Charcoal	Straight side, round bottom
47	Feature 12	5	9	4/4	Charcoal	Straight side, round bottom

Figure 13a. Structural Complex 1 (excavation block A) at base of plow zone.

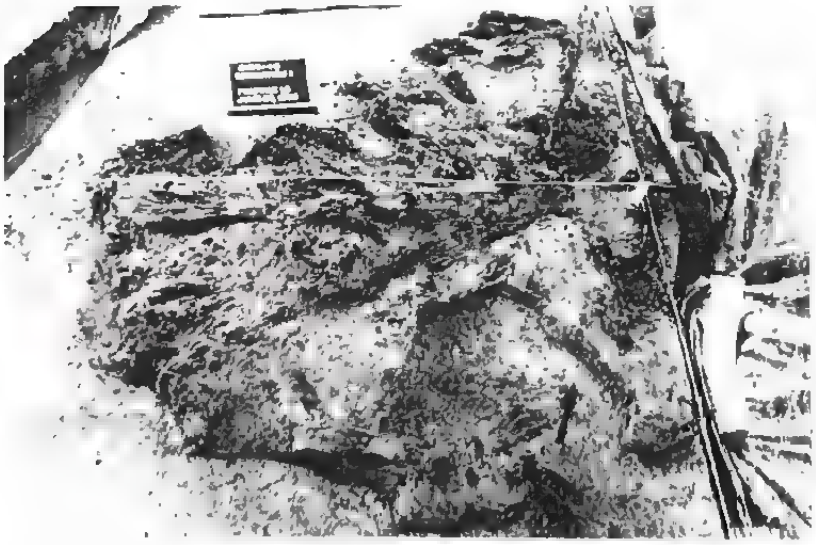


Figure 13b. Burned roof poles in center of Structure 1b.

wall poles were present along the western wall and in the southwestern corner of the structure.

The gray and white ash covering the structure was 1 to 3 cm thick and probably represented the roof of the structure. Beneath this layer were found the intact house floor, baked clay areas representing portions of the floor that were oxidized during the fire, and charred wall and roof poles. The structure depression was excavated at least 10 cm into the subsoil. The recovery of high frequencies of cultural material in the plow zone above the structure suggests that the depression was deeper at one time and used for refuse disposal after the burned structure was abandoned. Given the highly eroded surface soils in the project area (the Bonnie Creek site plow zone is essentially clay), the structure depression may have been quite deep. The plow zone above the structure had a general depth of 20 cm which, when combined with the thickness of the ash layer and floor, gives a minimum depth of 30 cm for the depression.

Four heavier concentrations of ash (features 1, 9, 10, 12) containing large amounts of wood charcoal were found within the gray/white ash layer. These four ash concentrations were distributed in a northwest-southeast pattern across the structure. Three of the concentrations (features 9, 10, 12) adjoin each other and were defined as separate features on the basis of subtle color differences. The distribution of these ashy areas may be associated with the collapse of the western half of the structure during the fire. Based on the orientation of the western wall poles and the ash concentrations, it appears that the western wall and roof of the structure collapsed eastward into the structure depression. The four ash concentrations may represent part of the western roof that fell eastward into the depression during the fire. Feature 1 was located in the southeastern corner of the structure and measured 1.8 m east-west by 1.1 m north-south (Figure 11). At least 10 small round poles varying in diameter from 4 to 5 cm with a maximum length of 23 cm (one specimen) were contained within the feature. Feature 9 was the largest of the three ash concentrations, originating in the northwestern corner of the structure and extending southeastward into the structure for 3.2 m. The stain varied in width with a maximum width of 3.4 m occurring near the western structure wall. Feature 9 provided the clearest example of the origin of the three ash stains with small poles scattered singly and in concentrations throughout the feature. The heaviest concentration of poles was located in the northwestern corner of the structure in between the Structure 1a and 1b wall trenches. The orientations of the individual poles were recorded, but no distinct pattern was observable. This suggests that most of the poles fell randomly into the depression as the structure burned rather than collapsing as a unit. The densest concentration of poles occurred immediately above the junction of the Structure 1a wall trenches (features 20 and 22) where a mass of poles lay directly on top of each other. This concentration measured 55 cm east-west by 50 cm north-south and contained over 30 poles. Pole diameter ranged from 4 to 5 cm. Wood samples selected from this concentration were identified as hickory (Carya spp.) (Zalucha 1985: personal communication).

Feature 12 was located adjacent to features 9 and 10 but contained much less carbonized wood and was lighter in color. The feature measured 1.6 m east-west with a maximum width of 75 cm. A series of 11 poles in the center of the feature was more regularly distributed than those in feature 9, with nine of the poles oriented north-south. Pole diameter was approximately 5 cm, while pole length varied from 25 to 42 cm.

Feature 10 was a very dense concentration of charred poles and ash covering the center of the house (Figures 11 and 13b). The feature had two parts, a central area that contained the majority of the charred poles with maximum dimensions of 1.88 m northwest-southeast by 1.80 m southwest-northeast, and an area of less dense charcoal to the west that measured 1.25 m north-south by 0.95 m east-west. The poles within feature 10 were the best preserved poles within the structure (Figure 13b). The orientation of the poles was mapped, but similar to feature 9, the poles were oriented in all directions, suggesting that the roof framework either collapsed in small sections or that it burst apart when it collapsed. Pole diameters were similar to those of the other ash features (4-5 cm). Length (obtained on a sample of 24 poles) ranged from 22 to 66 cm with a mean length of 40.8 cm.

In addition to the small diameter poles, a group of approximately 30 large diameter wall poles (feature 16) was located along the western and southern walls of the structure (Figure 14). Fourteen of these poles originated within the southern or western wall trenches, with all but three of the poles oriented in northeast-southwest. The northernmost poles were located beneath the ash and small pole concentration interpreted as the roof (feature 11). Based on the orientation of the wall poles and their location beneath feature 10, the southern and western walls of the structure apparently collapsed into the house depression in a northeast direction, with the burning roof then collapsing into the depression in the opposite direction. Wall pole diameter (20 specimens) ranged from 4 to 10 cm with a mean of 7 cm. The upper end of the measurement range (10 cm) is probably a more accurate measurement of the diameter of the wall poles. Some of the poles were shovel skimmed when the structure was first defined, resulting in deterioration and smaller dimensions. One of the wall poles from the southern wall trench was submitted for botanical analysis and identified as Carya spp. (hickory) (Zalucha 1985: personal communication).

A radiocarbon sample consisting of a large section of one of the burned wall poles from the western side of the structure returned a date of A.D. 1330±50 (Beta 8478). This date was corrected to A.D. 1302±30 using the procedures developed by Damon et al. (1974). Both dates are in general agreement with the ceramic assemblage from the site, which exhibits late attributes such as red filmed jar rims, cordmarking, and incised plates.

Additional poles were scattered throughout the structure. A series of north-south/east-west oriented small diameter poles were located between the southern wall trench (feature 21 and feature 10) (Figure 11). This group of 10 poles may be part of a section of the roof that collapsed in one piece given the similar orientation of the poles. The

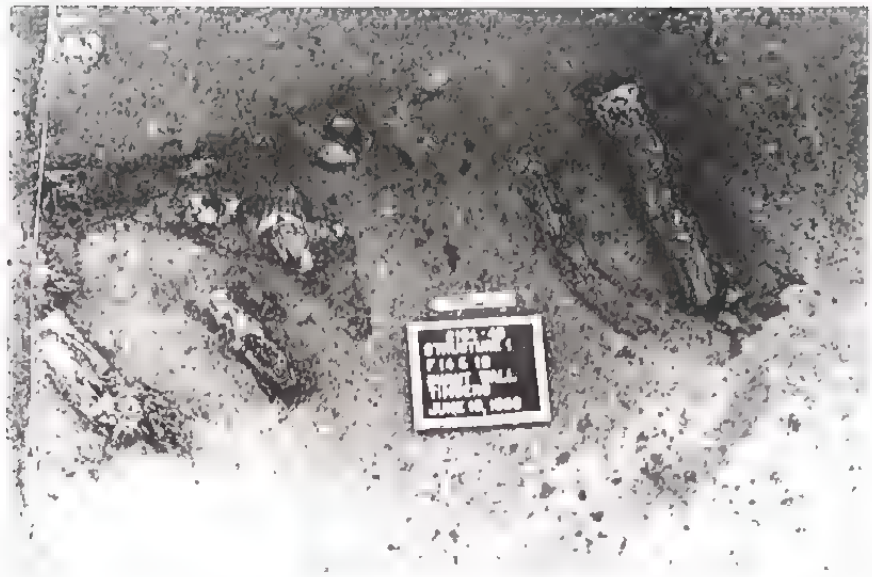


Figure 14a. Burned wall poles (features 14 and 16), west wall of Structure 1b.

Figure 14b. Burned wall poles (feature 16) overlying ceramic trowel, west wall of Structure 1b.

eastern half of the structure contained very little in the way of charred wood, but two large diameter poles partially overlay the western wall trench (feature 18) while one was located north of the gap in the southern wall trench (feature 21). Only one set of crossed small diameter poles (feature 17) that could represent an intact section of the structure framework was recorded. This group of four poles was located immediately south of feature 9 and consisted of three 3-5 cm diameter poles separated by 5 cm intervals overlain by a 25 cm long by 5 cm diameter pole.

Irregular areas of hard baked clay representing portions of the structure floor that oxidized during the fire were located on the eastern (features 8, 13, 15, 24) and western (feature 25) sides of the structure. Feature 8 was a 5YR 4/6 yellowish red baked clay area immediately south of the northern wall trench which measured 1.25 m north-south by 0.75 m east-west. Features 15 and 24 were two 5YR 4/6 baked clay areas surrounded by a less intensely burned area of reddish brown soil (feature 13) along the eastern wall trench (Figure 11). The features covered a combined area of 3.13 m north-south by 1.95 m east-west. Cross-sections of the burned clay areas revealed that the baked clay ranged in thickness from 5 to 6 cm and was underlain by sterile clay. The single baked clay area located on the western side of the structure was feature 25, an elliptical area of 2.5YR 4/8 intensely burned soil located adjacent to feature 10 (Figure 11). This feature measured 1.1 m north-south by 0.88 cm east-west. All five of the baked clay areas (including feature 25) were located in areas of little or no wood charcoal and ash. The features probably indicate areas of the structure where the fire initially started, was intensely hot, and fueled with large amounts of oxygen. All wooden structural elements in these areas were completely consumed. The large amounts of ash and wooden poles in the southwestern part of the structure indicate that the fire was not as intense in this area, with the framework partially preserved.

Feature 27, a circular hearth, was the single internal feature within Structure 1b (Figure 11). The feature originated immediately below feature 10, the concentration of collapsed roof poles and ash in the structure center, suggesting that the feature was in use at the time of the fire and is associated with Structure 1b. However, the hearth is not centrally located, being approximately 1.70 m from the southern wall trench and 3.30 m from the northern wall trench. In terms of Structure 1a, however, the hearth is located almost equidistant from the northern and southern wall trenches. Only one hearth was identified for the two structures, and it could be that feature 27 represents the hearth for both structures. The hearth was an almost perfectly circular 5YR 4/6 baked clay basin with a diameter of 60 cm. The feature had an internal depth of 5 cm. A 4 cm thick layer of burned soil underlay the basin. The hearth contained a 10YR 2/1 black silty loam containing charcoal and burned bone flecks. Cultural material was not present.

Ten post molds were found within Structure 1b (Figure 11; Table 10). It is uncertain which of the two structures these posts are associated with. Seven of the post molds (post molds 19, 20, 25, 26, 28,

Table 10. Interior Post Molds, Structural Complex 1.

Post Mold	Diameter (cm)	Depth (cm)	Munsell Color (10YR)	Inclusions	Material	Comments
19	10	10	4/4	-	-	Charred post
20	21	14	4/4	-	-	Charred post
40	10	13	4/6	-	-	-
48	15	15	3/4	Charcoal, burned clay	-	-
49	14	7	4/4	-	-	-
50	12	11	4/4	Charcoal	-	Charred post Post with ramp
51	28	14	3/4	-	-	-
52	20	16	4/1	Charcoal	-	-
53	14	4	3/1	-	-	-
54	22	110	4/1	-	-	Center post
55	20	32	3/1	-	-	Natural

48, 50) have a patterned distribution within Structure 1b, with three post molds located to either side (east and west) of the structure and one deep post mold (post mold 28) located in the center. Four of the post molds (post molds 20, 48, 50, 52) were similar in appearance, ranging from 6 to 15 cm deep with a mean depth of 12.8 cm. The diameters ranged from 12 to 20 cm with a mean of 16.5 cm. All were sloping-sided, round-bottomed post molds, including post mold 50, which contained the charred remains of a post. Post mold 19 contained a small charred pole surrounded by a ring of burned clay. The pole was set on an angle pointing toward the east wall of the structure. The pole was 4 cm in diameter with a depth of 8 cm beneath the structure floor. Post mold 51 was the only post on the structure edge to have a ramp (feature 26). The ramp was oriented east-west and measured 59 cm by 20 cm. The ramp sloped to the east, with the post mold located at the eastern end. Post mold 51 was straight sided, round bottomed, 28 cm in diameter, and 14 cm deep.

Post mold 54 was a very deep post with a ramp (feature 28). The post mold is located equidistant between the north and south wall trenches of Structure 1a, and it may have been associated with this structure. Post mold 54 was located in the center of a shallow oval basin (feature 28). This basin actually appears to have been a shallow ramp, with the sides sloping down to connect with the post mold at the base of the feature. Feature 28 measured 54 cm north-south by 44 cm east-west and extended 20 cm beneath the house floor. Cultural material within the feature consisted of shell-tempered sherds (n=9) and lithic debitage (n=4). The centerpost (post mold 54) had a diameter of 20 cm

and extended 1.10 m beneath the base of feature 28. The post mold was straight sided, round bottomed, and contained a 10YR 3/1 very dark gray fill. Cultural material was not recovered from the post.

The wall trenches (features 11, 20, 22, and 29) varied in width from 15 to 22 cm with a mean of 26.5 cm. Depth ranged from 18 to 93 cm with a mean of 39.8 cm. All of the trenches were straight sided in profile, gradually tapering to form a rounded base. The trenches were filled with a 10YR 3/6 to 4/4 redeposited midden.

Artifact Distribution. Information on artifact distribution within the structure was obtained by plotting the location of individual artifacts and by screening the contents of the structure through 1/4 in. mesh (Figure 15; Tables 11 and 12). The recovery of an intact pottery trowel and celt from the southwestern corner of the structure suggested that Structure 1b was still in use at the time of the fire. Both of these were complete artifacts, and their presence within the structure suggested that additional artifacts that could indicate the location of internal activity areas might be present within the structure. In order to examine this possibility, crew members were instructed to plot the locations of artifacts whenever possible.

The distribution of pieceplotted material indicated that the majority of material was located in the southern half of the structure, with higher concentrations occurring in the corners (Figure 15). The artifact distribution roughly paralleled the location of ash and wood charcoal over the structure, suggesting that the absence of artifacts in the northern half of the structure (above which much wood charcoal occurred in the plow zone) is the result of plow disturbance. The southeastern corner artifacts consisted of 4 cobble tools, 15 sherds, and a piece of burned clay. The southwestern corner contained a more diverse assemblage including 7 cobble tools, 15 sherds, 4 pieces of debitage, and the pottery trowel and celt. If the material located on and outside the Structure 1b wall trenches are included in the total, two projectile points and four additional sherds occur in the western half of the structure, while only one occurs in the eastern half. The pieceplotted artifacts suggest that, as far as the southern half of the structure is concerned, prehistoric activities were largely concentrated in the corners of the structure. A gap exists between the two pieceplotted concentrations in the area of the presumed door (Figure 15). Activities indicated by the pieceplotted artifacts include food preparation (manos), lithic tool manufacture (chert hammer), and pottery manufacture (ceramic trowel). The occurrence of two complete tools--the celt and pottery trowel--in the southwestern corner of the structure could indicate that this corner of the structure was either a work or storage area.

The distribution of screened material from the structure, however, does not support the material clusters indicated by the pieceplots. Instead, there appears to be a relatively even distribution of material across the southern half of the structure. Five hundred and sixty six pieces of material (including the pieceplotted artifacts) were recovered from the structure (Table 12). The mean artifact frequency per m^2 was

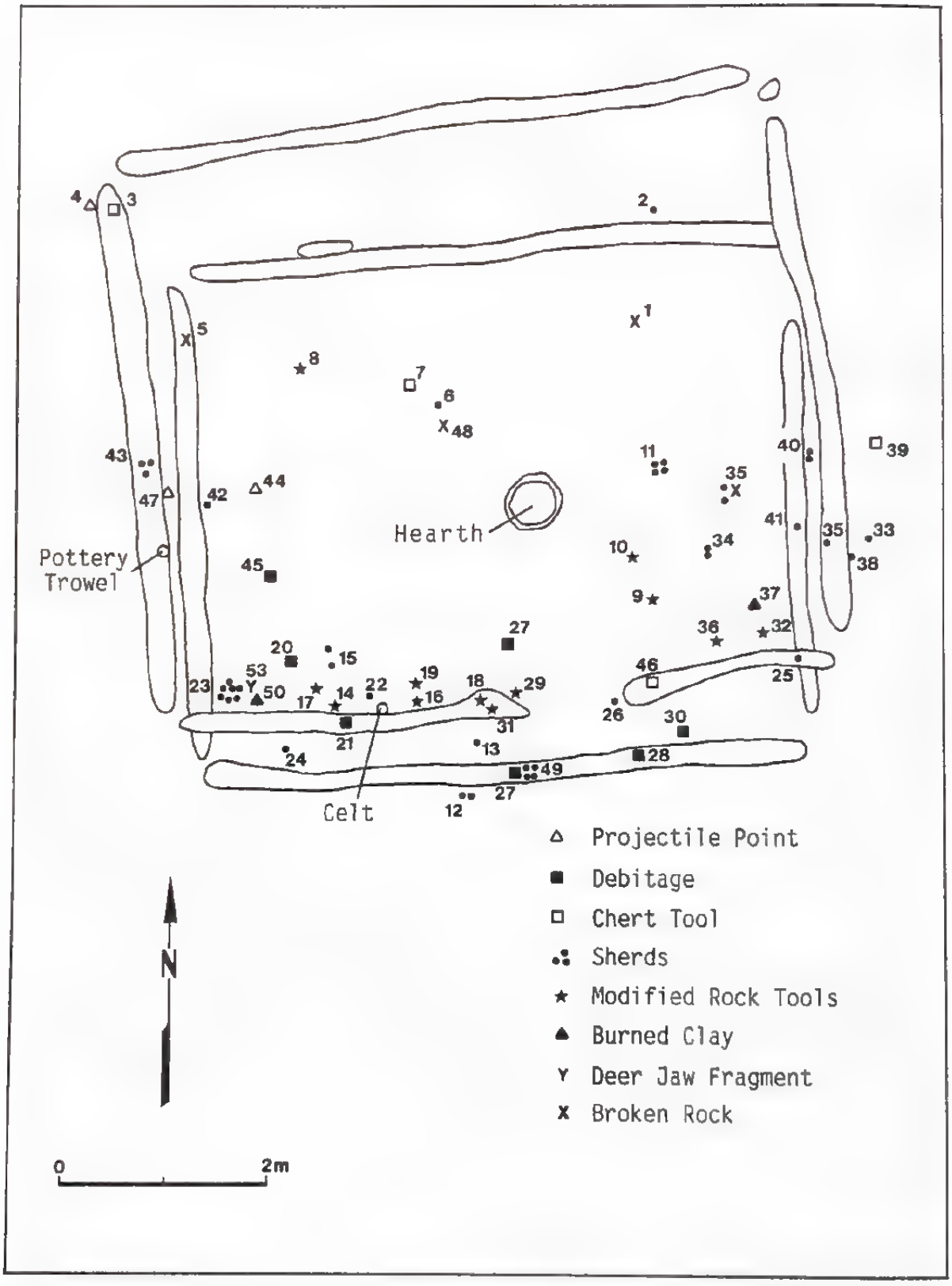


Figure 15. Pieceplotted artifact distribution, Structural Complex 1.

Table 11. Pieceplotted Artifacts, Structural Complex 1.

Specimen No.	Unit	Chert Debitage	Chert Tool	Mississippian Ceramics	Modified Rock*	Groundstone	Broken Rock	Other
1	55						2 I/M (6g)	
2	56			1 Body Sherd (1g)				
3	59		1 Scraper (12g)					
4	59		1 Projectile Point (2g)					
5	60						1 Limonite (18g)	
6	61			1 Body Sherd (26g)				
7	61		1 Scraper (4g)					
8	61				1 Hammer (217g)			
9	62				1 Hammer (516g)			
10	62				1 Hammer (158g)			
11	62			4 Body Sherd (23g)				
12	64			2 Body Sherd (28g)				
13	64			1 Body Sherd (3g)				
14	64				1 Hammer (328g)			
15	64			1 Body Sherd (6g)				

*The modified rock category consisted of naturally formed igneous/metamorphic cobbles or sandstone fragments exhibiting wear on one or more surfaces. For the purposes of the lithic analysis, Koldehoff (this volume) has subsumed this category into the groundstone category.

Table 11. (cont'd).

Specimen No.	Unit	Chert Debitage	Chert Tool	Mississippian Ceramics	Modified Rock* Groundstone	Broken Rock	Other
16	64				1 Mano (313g)		
17	64				1 Mano (523g)		
18	64				1 Chert Hammer (536g)		
19	64					1 Pebble (27g)	
20	64	1 (3g)					
21	64	1 (2g)					
22	64			1 Body Sherd (2g)			
23	63			1 Rim (1g) 1 Body Sherd (7g)			
24	63			1 Body Sherd (8g)			
25	65			1 Rim (5g)			
26	66			1 Body Sherd (2g)			
27	66	1 (4g)					
28	66	1 (22g)					
29	66				1 Sandstone Abrader (44g)		
30	66	1 (2g)					
31	66				2 (151g)		
32	68				1 Mano (503g)		
33	68			1 Body Sherd (29g)			
34	68			2 Body Sherd (22g)			
35	68			2 Body Sherd (54g)		1 Sandstone (53g)	
36	68				1 Hammer (516g)		

Table 11. (cont'd).

Specimen No.	Unit	Chert Debitage	Chert Tool	Mississippian Ceramics	Modified Rock*	Groundstone	Broken Rock	Other
37	68							1 Burned Clay (29g)
38	68			2 Body Sherd (21g)				
39	68		1 Knife (25g)					
40	68			1 Rim (2g)				
41	68			1 Body Sherd (2g)				
				1 Body Sherd (3g)				
42	70			1 Rim (3g)				
43	70			3 Body Sherd (6g)				
44	70		1 Projectile Point (2g)					
45	70	1 (2g)						
46	66		1 Scraper (17g)					
47	70		1 Projectile Point (2g)					
48	61						1 (6g)	
49	64			4 (25.6g)				
50	63							1 Burned Clay (4g)
51	64					1 Celt (260g)		
52	70							1 Pottery Trowel (148g)
53	63							Deer Jaw Fragment (?g)
A	**	1 (37g)						

** No unit; the artifact was recovered on the stripped clay surface south of Structural Complex 1

Table 12. Material Frequencies, Excavation Units, Structural Complex 1.

Unit	Chert Debitage	Chert Tools	Ceramics	Rock	*Modified Rock Tools	Ground-stone Tools	Fauna	Burned Clay	Total	Percent
55(N262,E188)	4	1	7	2	-	-	1	27	42	7.4
56(N264,E188)	-	-	1	-	-	-	-	-	1	0.2
57(N264,E190)	-	-	-	-	-	-	-	1	1	0.2
58(N264,E186)	1	-	20	-	-	-	-	-	21	3.7
59(N264,E184)	2	2	-	1	-	-	-	-	5	0.9
60(N262,E184)	15	2	10	-	-	-	-	23	50	8.8
61(N262,E186)	1	4	9	4	1	-	-	1	20	3.5
62(N260,E188)	15	5	42	17	2	-	-	7	88	15.5
63(N258.5,E185)	3	1	14	7	-	-	1	-	26	4.6
64(N258.5,E186)	1	-	6	6	4	1	-	-	18	3.2
65(N258.5,E190)	-	-	1	1	-	-	-	-	2	0.4
66(N258.5,E188)	3	2	5	-	2	-	-	-	12	2.1
67(N260,E186)	5	4	23	11	-	-	-	-	43	7.6
68(N260,E190)	11	3	20	11	3	-	-	113	161	28.4
69(N262,E190)	-	-	1	2	-	-	-	40	43	7.6
70(N260,E184)	3	3	19	4	1	-	-	3	33	5.8
Total	64	27	178	66	13	1	2	215	566	
Percent	11.3	4.8	31.4	11.7	2.3	0.2	0.4	38.0		

*The modified rock category consisted of naturally formed igneous/metamorphic cobbles or sandtone fragments exhibiting wear on one or more surfaces. For the purposes of the lithic analysis, Koldehoff (this volume) has subsumed this category into the groundstone category.

10.4. Material frequencies above the mean occurred on the southern, western, and eastern sides of the structure. The highest frequency (n=159) occurred in the southeastern corner of the structure (unit 260E190), but the majority (n=113) of this material was burned clay. If burned clay is deleted from the list of recovered material, the mean artifact frequency for the structure falls to 6.3 per m^2 and the highest artifact frequencies occur in the southern half of the structure. The combined mean artifact frequency (8.3 per m^2) for the southwestern units (63, 64, 67, and 70) was slightly lower (10.0) than that of the three southeastern units (62, 66, and 68). This is the opposite of what the pieceplotted data indicated. The pieceplotted data also indicated that very little material was contained in unit 62, which was located in front of the presumed entrance. In reality, this unit had the highest material frequency per m^2 (20.25) of any excavation unit.

Of the two techniques used to examine material distribution within Structure 1b--pieceplotting and screening--screening is judged to have been the more reliable method. The high concentrations of pieceplotted materials within the southern structure corners are interpreted as resulting from differences in ability between individual crew members. The great disparity in material frequencies between the southern and northern halves of the structure is not cultural but the result of the destruction of the northern part of the structure basin by plowing.

Discussion. Of the two structures comprising Structural Complex 1, Structure 1b provided the most information regarding Mississippian architecture in the upper Galum Creek valley. The wooden pole remains and the post mold pattern within Structure 1b suggest that:

1. Both small (ca. 4 cm) and large (ca. 10 cm) unpeeled hardwood poles were set vertically in the wall trenches; the cluster of crossed small diameter (2.5 to 4 cm) poles in the northwest structure corner represents the remains of a framework of hardwood poles lashed to the vertical poles; the roof consisted of small (3-5 cm) diameter poles; and botanical analysis of a western wall pole indicated that it was Quercus spp. (oak) while a single small diameter pole from the northwest structure corner was identified as Carya spp. (hickory). Both of these wood types are hard, resilient, durable, and rot resistant. Oak and hickory would have been preferable where strength and durability were important in contrast to woods such as ash and elm, which would have been preferable if bendability was desired (Zalucha 1985: personal communication). If the analysis of the two pole samples is representative of the wood types comprising the structure framework, the implication is that the structure was a sturdy building with a roof comprised of nonbendable poles. Bark was still present on at least one of the large (ca. 10 cm diameter) wall poles, one of the poles in the northwest corner, and one of the roof poles.

2. The roof was supported by a crosswork of beams placed across the internal posts located on either side of the stucture and possibly across the central post as well. Because Structures 1a and 1b overlap, it is not clear with which structure the posts are associated. However, the two post molds at the south end of the structure (post molds 50 and

52) were charred, indicating an association with the later structure. These post molds were located parallel to each other, and a beam could have been strung across them from the west to the east walls. The situation with the other posts is unclear. Post mold 54 is probably a central roof support post, but it is uncertain with which structure it or the other internal posts are associated.

3. The structure was not clay covered. Although a large amount of burned clay was recovered from the structure, the majority of this clay came from areas of the house where the floor had been baked by the fire that destroyed the structure.

4. The gap in the structure wall trenches represents an entranceway to the south. In the earlier structure (1a), this entranceway was located in the northeastern corner.

5. Based on shared structural elements, the two structures (1a and 1b) are very close in time. The hearth (feature 27) is centally located within the earlier structure but was in use at the time of the fire which destroyed the later structure based on the presence of wooden roof poles immediately above it. This suggests that the same hearth may have been used in both structures. Both structures are similar in size, have the same orientation, and have gaps in their wall trenches that represent entranceways, factors that suggest the structures are closely related.

Structural Complex 2

Structural Complex 2 was located on the western site margin and consisted of one large structure (2a) and four overlapping small structures (2b-e) (Table 13; Figure 16). This structure complex was discovered during the mechanical stripping when wooden poles and burned clay were exposed over an approximate 100 m^2 area at the base of the plow zone. The presence of burned poles in the plow zone indicated that part of the wooden framework of this second set of structures was still intact. Efforts to define the structure limits through shovel scraping failed as the subsoil baked out almost immediately and became impossible to scrape. Two 50 cm wide trenches were hand excavated through the wood charcoal and burned clay scatter to locate the structure wall trenches and determine the approximate size and number of structures present (Figure 17). Units within the trenches were 2 m long and were excavated in a single level from the top of the stripped surface to sterile clay (approximately 10 cm or less). The north-south trench extended from N250E154 to N262E154 (12 m), while the east-west trench extended from N200E148 to N200E160 (12 m). These trenches revealed that the structural complex consisted of a very large structure and a complicated set of at least three overlapping smaller structures. The larger structure consisted only of wall trenches, but a midden filled house depression and charred pole fragments were associated with the smaller structures (Figure 18). A grid of 4 m^2 units was superimposed over the structural complex, with all units excavated in natural levels (Figure 17). Artifacts were pieceplotted whenever possible, but a large amount of material was recovered in the 1/2 in. mesh screen. Post molds within

Table 13. Wall Trench Data, Structural Complex 2.

Provenience	Length (m)	Maximum Width (cm)	Depth (cm)	Munsell Color 10YR)	Inclusions	Shape
Structure 2a						
Feature 56	7.76+	19	50	4/3 to 4/4	Charcoal, burned clay	Straight side, round bottom
Feature 60	7.50+	22	55	3/4	Charcoal, burned clay, burned bone	Irregular side, round bottom
Feature 70	8.42	23	40	5/4 to 5/6	Charcoal	Straight side, round bottom
Feature 71	6.30+	23	36	3/4 to 5/4	Charcoal, burned clay	Straight side, flat bottom
Structure 2b						
Feature 72	Unknown	26	30	3/4	Charcoal	Straight side, round bottom
Feature 86	Unknown	22	33	4/3	Charcoal, burned clay	Straight side, round bottom
Feature 92	2.45	24	26	5/4	Charcoal, burned clay	Straight side, round bottom
Structure 2c						
Feature 55	4.38	20	48	4/6 to 5/6	Charcoal, burned clay, burned bone	Sloping side, flat bottom
Feature 61	5.38	28	48	3/4	Charcoal	Straight side, round bottom
Feature 63	4.00	23	39	3/4 to 5/6		Straight side, round bottom
Feature 64	4.26	25	22	4/4		Straight side, round bottom
Structure 2d-e						
Feature 58	3.20	32	32	4/4 to 5/4	Charcoal	Sloping side, flat bottom
Feature 59	3.98	21	21	4/6	Charcoal, burned clay	Straight side, round bottom
Feature 62	4.50	20	40	3/4		Sloping side, flat bottom
Feature 65	5.00	35	31	3/4	Burned clay	Straight side, round bottom
Feature 66	4.50+	14	41	3/3	Charcoal, burned clay	Straight side, round bottom
Feature 74	4.38	18	18	3/4 to 5/4		Sloping side, round bottom

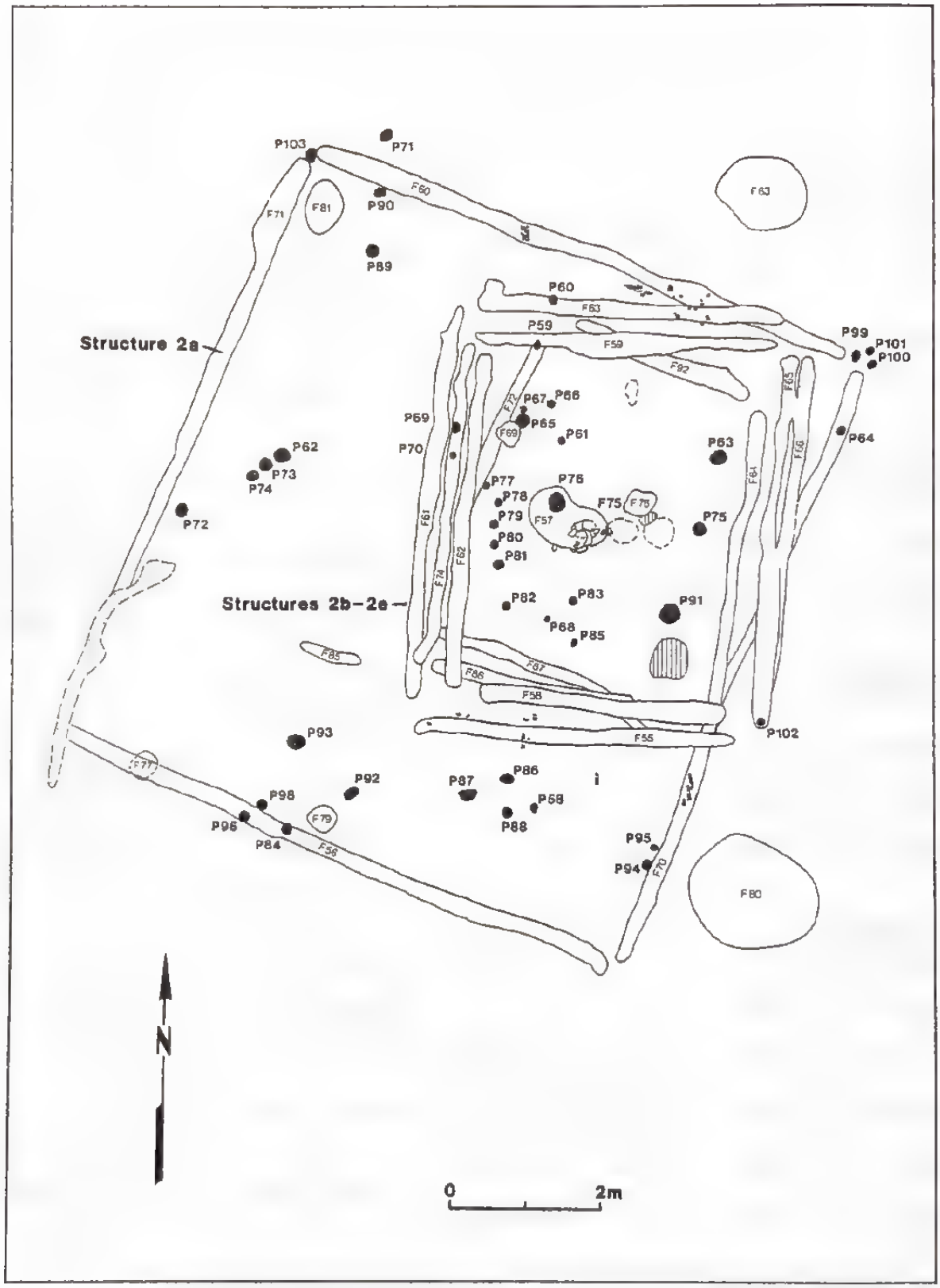


Figure 16. Structural Complex 2.

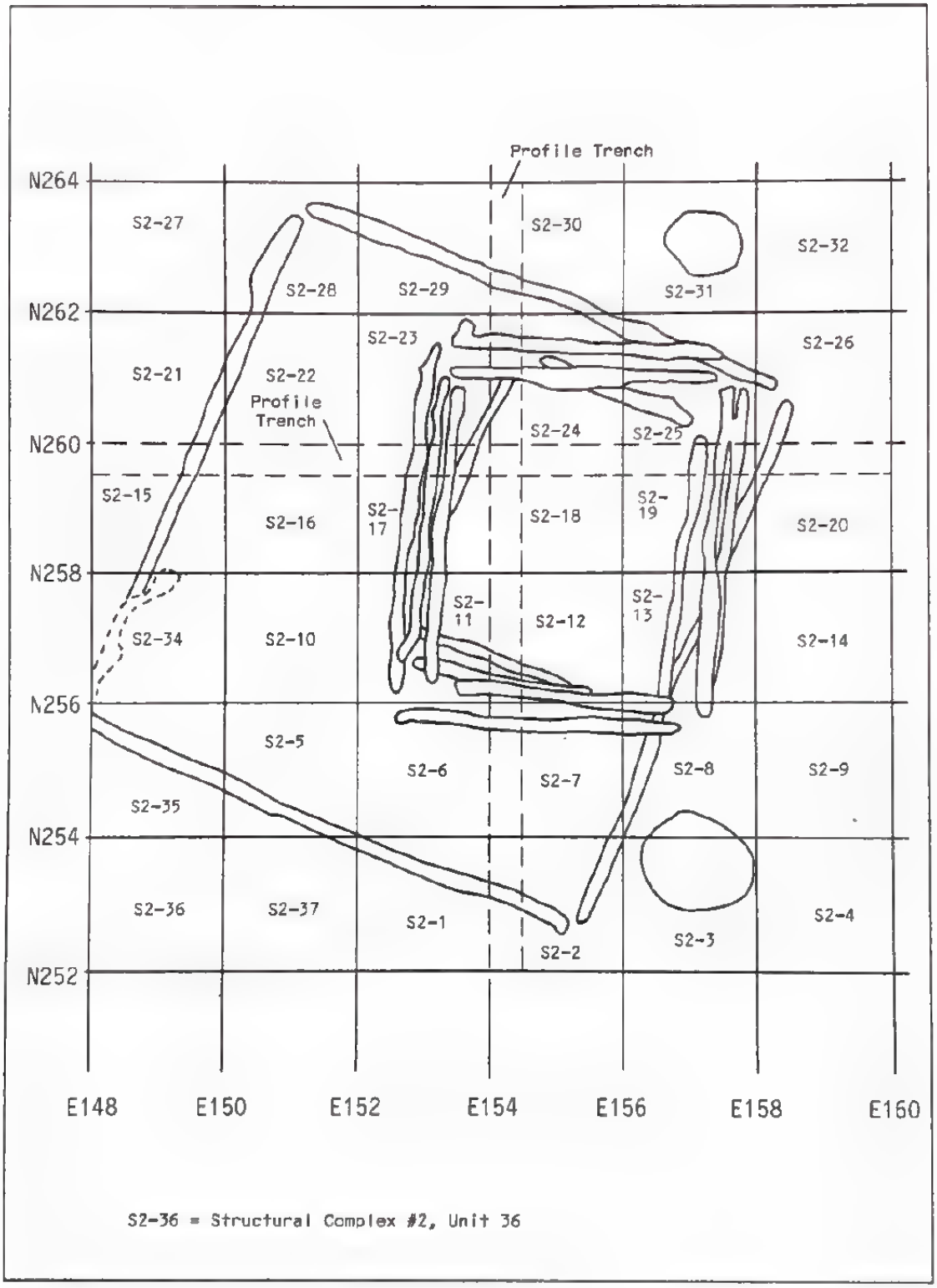


Figure 17. Excavation units, Structural Complex 2.

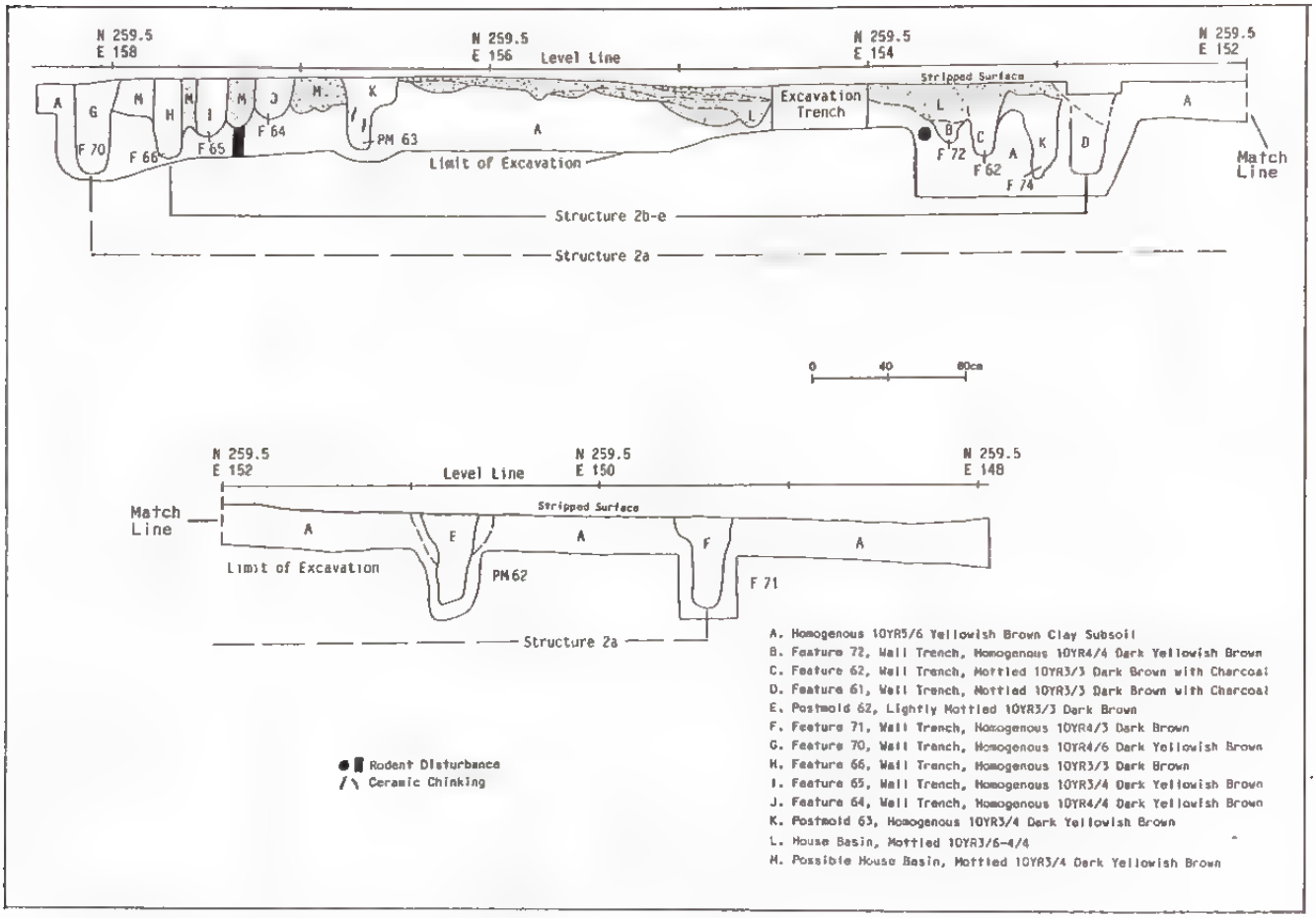


Figure 18. Cross section, Structural Complex 2.

the wall trenches were mapped and cross-sectioned only where the excavation trenches crossed the wall trenches. All post molds within the area enclosed by the structure walls were mapped and cross-sectioned.

Structure 2a. Structure 2a was a very large square wall trench structure with maximum exterior dimensions of 8.2 m northeast-southwest by 8.9 m northwest-southeast (72.98 m^2). The interior dimensions were 8.5 m northwest-southeast by 7.6 m northeast-southwest (64.6 m^2) (Table 14). The northeastern and northwestern structure corners were closed by post molds (post molds 99-101, 103). The southeastern corner of the structure was open, while the southwestern corner had been destroyed by a rodent disturbance. The structure wall trenches (features 56, 60, 70, 71) varied in width from 19 to 23 cm with a mean of 15.75 cm (Table 13). The depth below the stripped surface varied from 41 to 60 cm with a mean depth of 51.75 cm. All were filled with a redeposited midden varying in color from a 10YR 4/3 yellowish brown to a 10YR 3/3 brown.

One small linear stain interpreted as a possible wall trench (feature 85) was located in the southwestern quarter of Structure 2a (Figure 16). The feature measured 37 cm long and had a maximum width of 7 cm. In profile, the feature was straight sided, flat bottomed, and very shallow (5 cm). The feature fill was a charcoal flecked 10YR 3/4 dark brown silty clay that contained no material. The feature may be a natural disturbance, but no offshoots typical of a rodent or root disturbance were present. Feature 85 may represent the remains of an interior wall or partition within the larger structure.

Structure 2a may have been destroyed by fire. Two large diameter charred poles (presumably wall poles) were located directly above the north wall trench (feature 60), and small diameter poles were located above the southern part of the east wall trench (feature 70). Discolored soil or burned clay areas similar to those of Structure 1b were not present. The larger of the two pole fragments from the north wall trench was submitted as a radiocarbon sample and returned a date of A.D. 1290±50. This date was adjusted to A.D. 1280±30 using the formula provided by Damon et al. (1974). The pole fragments from the eastern wall trench were also submitted as a radiocarbon sample and returned a date of A.D. 1220±50. This date was adjusted to A.D. 1214±30 following Damon et al. (1974).

Fifteen post molds and one pit feature (feature 81) were located within Structure 2a (Figure 13), with the southern wall trench of the structure cutting through a possible smudge pit (feature 77). Feature 81 was a medium-sized shallow basin containing domestic refuse. It is unknown whether it is associated with Structure 2a or the smaller set of structures (2b-e). Feature 79 was originally thought to be a smudge pit and was assigned a feature number but upon excavation was found to be a large post. The 15 post molds (post molds 58, 62, 72-74, 86-89, 92-95, 98 and feature 79) ranged in diameter from 5 to 41 cm with a mean

Table 14. Structural Complex 2 Data.

Measurements (m)	Structure 2a	2b	2c	2d	2e
Exterior length	8.9	5.0	6.0	5.2	5.2
Interior length	8.5	4.5	5.5	4.7	4.7
Exterior width	8.2	4.7(?)	4.25	4.43	4.8
Interior width	7.6	3.98(?)	3.9	3.3	3.8
Maximum size (m^2)	72.98	23.5(?)	25.5	23.0	24.9
Floor size (m^2)	64.6	17.89(?)	21.45	15.5	18.0
Orientation (long axis)	NE-SW	NE-SW	N-S	N-S	N-S

Radiocarbon dates	Unadjusted	Adjusted
Structure 2a	AD 1220 ± 50	AD 1214 ± 30
	AD 1290 ± 50	AD 1280 ± 30
Structure 2d-e	AD 990 ± 60	AD 1000 ± 31

of 18.5 cm (Table 15). The defined depths ranged from 6 to 40 cm with a mean of 17.8 cm. The post molds were filled with a silty clay that varied in color from a 10YR 3/3 dark brown to a 10YR 5/4 dark yellowish brown. Charcoal flecks were noted in the fill of seven posts. Cultural material was recovered from three post molds (58, 72, 89), with post mold 58 being chinked with three shell-tempered sherds. The post molds were clustered in the southeastern corner and along the western side of the structure and formed no consistent pattern. The western side of the structure was stripped several times during the mechanical stripping before the structure was discovered, and shallower post molds in this area may have been destroyed. The later construction of Structures 2b-e through the northeastern corner of the structure also disturbed any overall pattern that may have existed. The remaining post molds weakly suggest that the roof was supported by widely spaced posts placed approximately 60 to 80 cm from the walls. Two clusters of post molds, one in the southeastern part of the structure (post molds 58, 86-88) and the other along the western wall (post molds 62, 73, 74), suggest that either groups of posts were needed in certain areas to support the roof or that the posts were periodically replaced. Post molds along the structure walls (post molds 72, 90, 94, 95, 98 and feature 79) could

Table 15. Interior Post Molds. Structure 2a.

Post Mold	Diameter (cm)	Depth (cm)	Munsell Color (10YR)	Inclusions	Material	Comments
58	17	15	4/3	Charcoal	1 shell-tempered sherd	
62	12	28	3/4 to 4/4	Charcoal		
72	17	10	4/4 to 4/6		3 shell-tempered sherds	
73	20	15	4/3 to 5/6	Charcoal		
74	19	4	3/4			
86	21	13	3/4	Charcoal		
87	21	19.5	3/3 to 3/4	Charcoal		
88	15	22	3/3 to 3/4	Charcoal		
89	28	21	4/4 to 5/4	Charcoal	Modified cobble tool	
90	22	25	4/4			
92	8	6	3/3 to 3/4	Charcoal		Possibly natural
93	26	22	3/4	Charcoal		
94	8	14	4/3	Charcoal		
95	5	6	4/4			
98	17	20	4/4			
Feature						
79	41	40	3/4			Post with basin
Corner Post Molds						
99	6	24	3/4			
100	15	11	3/4	Charcoal, burned clay		
101	11	14	3/4	Charcoal, burned clay	1 flake, 1 sherd	
103	10	10	3/4			Possibly natural
Exterior Post Mold						
71	10	12	3/4			

represent either roof support poles or repairs to the structure walls. Feature 79 was the largest post mold within the structure, with a surface diameter of 41 cm and a depth of 40 cm bs. The post mold was located within a shallow basin, with the post having an actual diameter of 20 cm.

Seven post molds associated with the structure wall trenches were excavated. Post molds 99-100 and 103 were exterior post molds used to close the northeastern and northwestern corners of the structure (Figure 16). The posts ranged in diameter from 10 to 16 cm with a mean of 11.75 cm. Three of the post molds (100, 101, 103) were similar in depth (10 to 15 cm) while post mold 99 was a narrow slanted post that extended 25 cm beneath the stripped surface. All of the post molds contained a 10YR 3/4 dark yellowish brown fill with scattered charcoal and burned clay flecks throughout. Post mold 100 contained a shell-tempered sherd, while post mold 101 contained a piece of lithic debitage. Post mold 64 was located in the part of the western wall trench intersected by the initial excavation trenches (Figure 16). This post was straight sided with a round bottom and contained a 10YR 5/6 fill virtually identical to that of the wall trench. The post had a diameter of 10 cm and was 45 cm deep. Post molds 84 and 96 were observed on the surface of the southern wall trench during the excavation of feature 79 and cross-sectioned. Both post molds were very shallow (9 and 20 cm, respectively) in comparison to the depth of the wall trench (49 cm) in this area, and they may postdate it. Post mold 84 was flat bottomed and set at an angle pointing north, while post mold 96 was straight sided and round bottomed. Neither contained any material.

Artifact Distribution. Similar to Structure 1b, crew members were instructed to plot the locations of artifacts within Structure 2a whenever possible in order to locate possible activity areas (Figure 19; Table 16). This material was numbered, and the distribution is indicated on Figure 16. In some cases, the excavators recorded the locations of individual pieces of material but combined the pieceplotted material with the remainder of the material from the unit. This material is shown on the figure but is unnumbered.

In contrast to Structure 1b, however, not all of the excavation units superimposed on the structure were screened. Units on the periphery of the structure (units S2-3, -8, -15, -21, -22, -23, -31, -34, -35) were not screened as the soil within these units was identical in color and texture to the culturally sterile subsoil although a small amount of material was present. Most of the material is small and may have entered the subsoil through root or rodent disturbances.

The pieceplotted artifacts included galena (n=1), limonite (n=1), chert tools (n=4), chert debitage (n=10), a projectile point, five modified cobble tools, and broken rock (n=11), sherds (n=11), rock (n=12), and burned clay (n=1). Four material clusters were identified: (1) seven pieces of lithic debitage (all Burlington/local chert) located over and around the southern wall trench (feature 56; pieceplot #1); (2) a cluster of rock, burned clay, chert debitage, and sherds located over an approximate 10 m^2 area near the western wall trench (feature

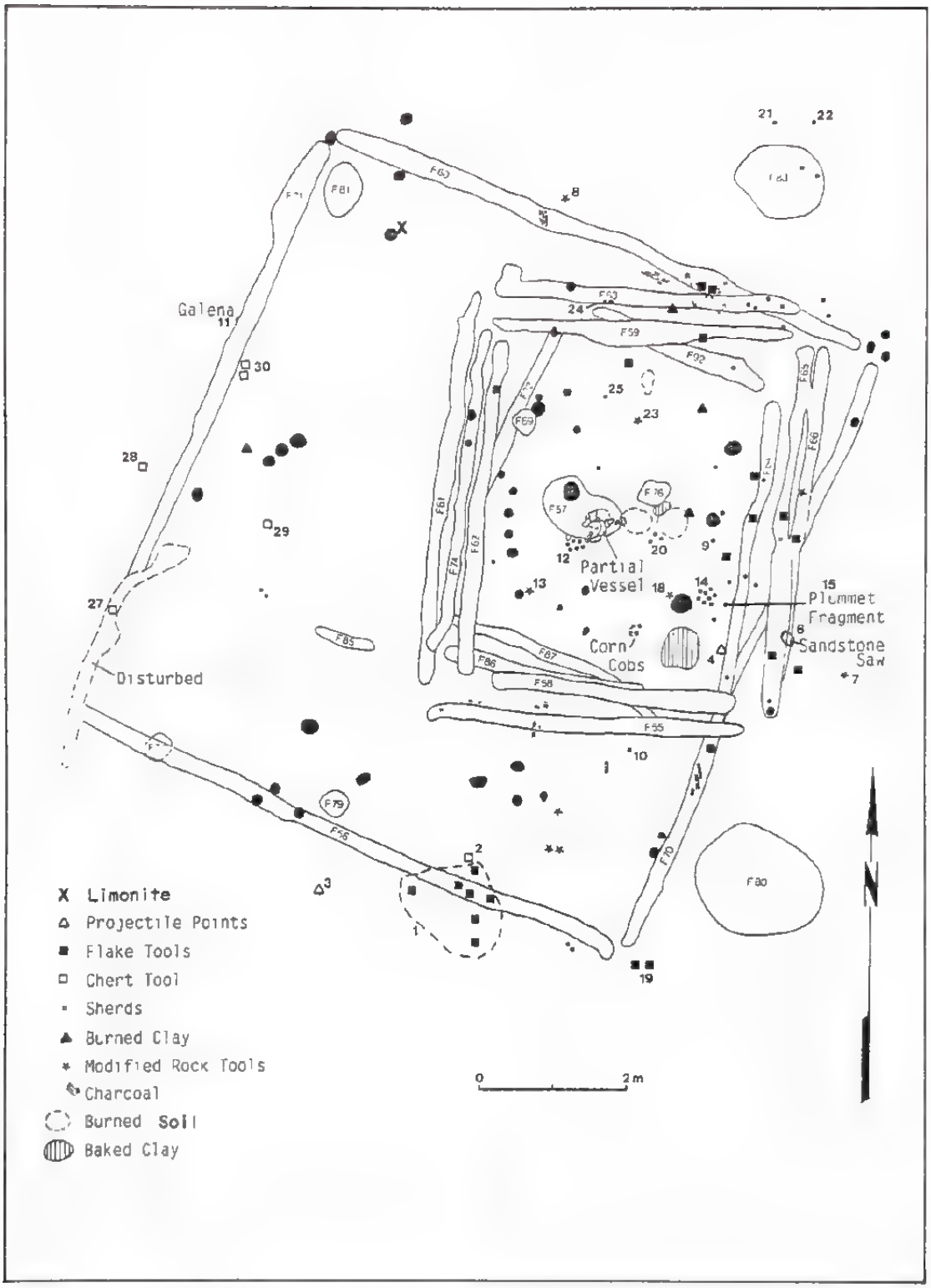


Figure 19. Pieceplotted artifact distribution, Structural Complex 2.

Table 16. Pieceplotted Material, Structural Complex 2.

Specimen No.	Unit	Chert Debitage	Chert Tool	Mississippian Ceramics	Modified Rock*	Groundstone	Broken Rock
1	S2-1	7 Adze Resharpening Flakes (21.5g)					
2	S2-7		1 Side Scraper(22g)				
3	S2-7		1 Biface Tip (4g)				
4	S2-13		1 Drill (3g)				
5	S2-2		1 Utilized Flake(14g)				
6	S2-13					1 Sandstone Saw (71g)	
7	S2-14				1 Mano (670g)		
8	S2-30				1 Limestone (39g)		
9	S2-7				1 Mano (260g)		
10	S2-7			1 Jar Rim w/Handles (17 g)			
11	S2-22						1 Galena (25g)
12	S2-18			4 Rims 21 Body Sherds (90g)			
13	S2-18				1 Hammer (819g)		
14	S2-13			8 Body Sherds (66g)			
15	S2-13					1 Plummet (13g)	
16	S2-13			1 Rim (16g)			

*The modified rock category consisted of naturally formed igneous/metamorphic cobbles or sandstone fragments exhibiting wear on one or more surfaces. For the purposes of the lithic analysis, Koldehoff (this volume) has subsumed this category into the groundstone category.

Table 16. (cont'd).

Specimen No.	Unit	Chert Debitage	Chert Tool	Mississippian Ceramics	Modified Rock*	Groundstone	Broken Rock
17	S2-1			1 Rim (6g)			
18	S2-12				1 Mano (386g)		
19	S2-1	2 (2g)					
20	S2-18			3 Body Sherds (52g)			
21	S2-31			1 Rim (4g)			
22	S2-31			1 Rim (20g)			
23	S2-18				1 Mano (230g)		
24	S2-24			2 Body Sherds (36g)			
25	S2-24			1 Body Sherd (20g)			
26	S2-36				1 Mano (150g)		
27	S2-34		1 Hoe Fragment (3g)				
28	S2-15	1(20g)					
29	S2-10		1 General Cutting Tool (2g)				
30	S2-22		1 General Cutting Tool (9.5g)				
			1 General Scraping Tool (4.5g)				

71); (3) a cluster of four sherds and three rocks located over and adjacent to feature 83, the large shallow basin north of Structure 2a; and (4) a slight clustering of three rocks, two pieces of debitage, and two sherds located over and south of feature 80, a large shallow basin south of Structure 2a. The material clusters near the two basins are interpreted as discarded items associated with the filling of the basins after their original function had ceased. The material cluster near the western wall trench may have some validity as a group as 1 to 2 m of open space separate these items from other pieceplotted artifacts within Structure 2a. The artifact types--galena, chert flakes, rock, and sherds--are not reflective of any particular task, which suggests that the prehistoric activity they represent is the use of this area for refuse disposal after the structure was abandoned.

That some of the pieceplotted material clusters do represent the locations of prehistoric activity areas was indicated by the cluster of Burlington debitage (pieceplot #1) located over and south of the southern wall trench. The cluster of seven flakes was very distinct when this part of the structure was shovel scraped, and two additional Burlington flakes were recovered by screening. These flakes were detatched from the blade of a Burlington adze or other large tool when the tool was resharpened (Koldehoff, this volume). The location of three of the flakes immediately above the wall trench indicates that this activity postdates Structure 2a and probably is associated with the smaller structures (2b-e).

The distribution of material from the screened excavation units provided little information regarding activity areas within the structure (Table 17). Material frequencies for the screened units (S2-1, -2, -5-8, -10, -16) ranged from 3 to 28 pieces per 4 m^2 unit with a mean of 11.8 pieces per unit. Frequencies above the mean occurred in three units (S2-2, -6, -7) in the southeastern corner of the structure. The relatively high frequency of material (n=38) from unit S2-2 is misleading as 13 of these artifacts were Late Woodland sherds that were part of a single vessel section. The higher frequencies of material in units S2-2 and -7 may be associated with filling activities associated with feature 80, a large refuse filled basin located immediately east of these two units. In sum, in contrast to Structure 1b where screening of the structure fill proved to be a more accurate indicator of possible activity areas, the opposite was true for Structure 2a. One activity area, a possible Burlington tool resharpening station, was located by pieceplotting; the screened data was inconclusive due to the small amount of material recovered.

Structures 2b-e. Structures 2b-e consisted of 14 wall trenches located in the northeastern corner of Structure 2a (Figure 16). The designation "2b-e" indicates that based on the presence of four western and four southern wall trenches, at least four separate building episodes are represented. It is uncertain whether this group of wall trenches represents the enlargement of a single rectangular structure through time or whether (similar to Structural Complex 1) completely new structures were erected in the same location as previous structures.

Table 17. Material Frequencies, Excavation Units, Structural Complex 2.

Unit	Chert Debitage	Chert Tools	-----Ceramics----- Shell Tempered	Grit Tempered	Rock	*Modified Rock Tools	Ground-Stone Tools	Fauna	Burned Clay	Other	Total (%)
S2-1	2	-	2	-	3	-	-	-	1	-	8(1.2)
S2-2	2	-	3	13	3	1	1	3	2	-	28(4.1)
S2-5	1	1	-	-	1	-	-	-	-	-	3(0.4)
S2-6	-	1	1	-	5	-	-	-	1	-	8(1.2)
S2-7	1	3	7	-	2	2	-	2	-	-	17(2.5)
S2-8	-	1	7	-	1	-	-	-	-	-	9(1.3)
S2-10	1	1	-	3	2	-	-	-	2	-	9(1.3)
S2-11	12	3	47	-	6	1	-	-	23	-	92(13.3)
S2-12	-	-	-	-	2	-	-	-	1	-	3(0.4)
S2-13	-	7	90	1	12	1	1	-	3	-	115(16.7)
S2-14	-	-	-	-	-	1	-	-	-	-	1(0.1)
S2-15	1	-	2	-	1	-	-	-	-	-	4(0.6)
S2-16	-	1	-	-	3	-	-	-	-	-	4(0.6)
S2-17	3	5	18	-	2	1	-	-	19	-	48(7.0)
S2-18	16	5	46	1	15	1	-	-	22	-	106(15.4)
S2-19	13	3	34	-	18	-	-	-	9	-	77(11.2)
S2-22	-	2	1	2	-	-	-	-	-	1**	6(0.9)
S2-23	1	-	1	-	5	-	-	-	-	-	7(1.0)
S2-24	9	-	14	4	10	-	-	-	4	-	41(5.9)
S2-25	2	3	25	1	4	1	-	-	3	-	39(5.7)
S2-28	3	2	14	-	4	-	-	-	-	-	23(3.3)
S2-29	1	-	-	-	6	-	-	-	1	-	8(1.2)
S2-30	1	-	-	-	3	-	-	-	-	-	4(0.6)
S2-31	-	-	23	-	3	-	-	-	1	-	27(3.9)
S2-34	-	-	-	-	1	-	-	-	-	-	1(0.1)
S2-35	-	-	-	-	1	-	-	-	-	-	1(0.1)
S2-36	-	-	-	-	-	1	-	-	-	-	1(0.1)
Total	69	38	335	25	113	10	2	5	92	1	690
%	10.0	5.5	48.5	3.6	16.4	1.5	0.3	0.7	13.3	0.1	

* The modified rock category consisted of naturally formed igneous/metamorphic cobbles or sandstone fragments exhibiting wear on one or more surfaces. For the purposes of the lithic analysis, Koldehoff (this volume) has subsumed this category into the groundstone category.
**Galena

Charred wooden poles were found above three of the wall trenches (features 55, 63, and 66), indicating that at least one of the structures was destroyed by fire. A pole located above the easternmost wall trench (feature 66) was submitted as a radiocarbon sample, returning a date of A.D. 990±60. This date is approximately 300 years earlier than the dates for the large structure (Table 14) through which the small structures are excavated. This date cannot be a correct date for these structures as it agrees neither with the archaeology nor with the culturally diagnostic material contained within the structure basin. It was very clear during excavation that the wall trenches of the smaller structures were excavated through those of Structure 2a, indicating that these structures should postdate that structure, minimally dating to the late thirteenth or early fourteenth centuries. Similarly, no terminal Late Woodland (Dillinger) or early Mississippian materials that would agree with the radiocarbon date were recovered at the site. As a result, the tenth century date for Structure 2b-2 is considered to be inaccurate.

The earliest of the small structures (2b) consisted of three wall trenches (features 72, 87, and 92) and was oriented parallel to and contained within Structure 2a (Figure 20). An eastern wall trench was not found. The only possible eastern wall trench (feature 64) was oriented at a different angle from the other Structure 2b wall trenches, indicating that it is associated with Structures 2c-e. The western wall trench to the structure was largely destroyed by the later construction of features 61, 62, and 74, and it is possible that the eastern wall trench was completely destroyed by the construction of the Structure 2c-e eastern wall trenches (features 64-66). The similar orientation of Structure 2b to Structure 2a and the lack of an eastern wall trench for the structure raises the possibility that the eastern wall trench of Structure 2a is also that of Structure 2b. If this is the case, the Structure 2b wall trenches could represent an internal partition within the very large Structure 2a. There is no evidence to support this outside of that just mentioned. The identical orientations of the two structures suggest that if they are not contemporary, they are very close in time with a later structure aligned with an earlier structure. None of the internal features within the structure can be definitely associated with it. The structure wall trenches varied in width from 26 to 33 cm with a mean width of 24 cm. The wall trenches were much shallower than those of Structures 2c-e, ranging in depth from 22 to 30 cm with a mean of 26 cm below the stripped surface. All of the trenches were straight sided with round bottoms (Table 13). The structure had an internal length of 4.5 m. If the eastern wall trench of Structure 2a is interpreted as representing the maximum possible width, the structure had to have been 3.98 m or less in width, with a maximum interior floor area of 17.89 m^2.

Structures 2c-e were comprised of three west wall trenches (features 61, 62, 74), two north wall trenches (features 59, 63), two south wall trenches (features 55, 58), and three east wall trenches (features 64-66). The construction sequence of these structures is not clear. However, based on the superpositioning of wall trenches, Structures 2c-e appear to consist of at least two separate structures

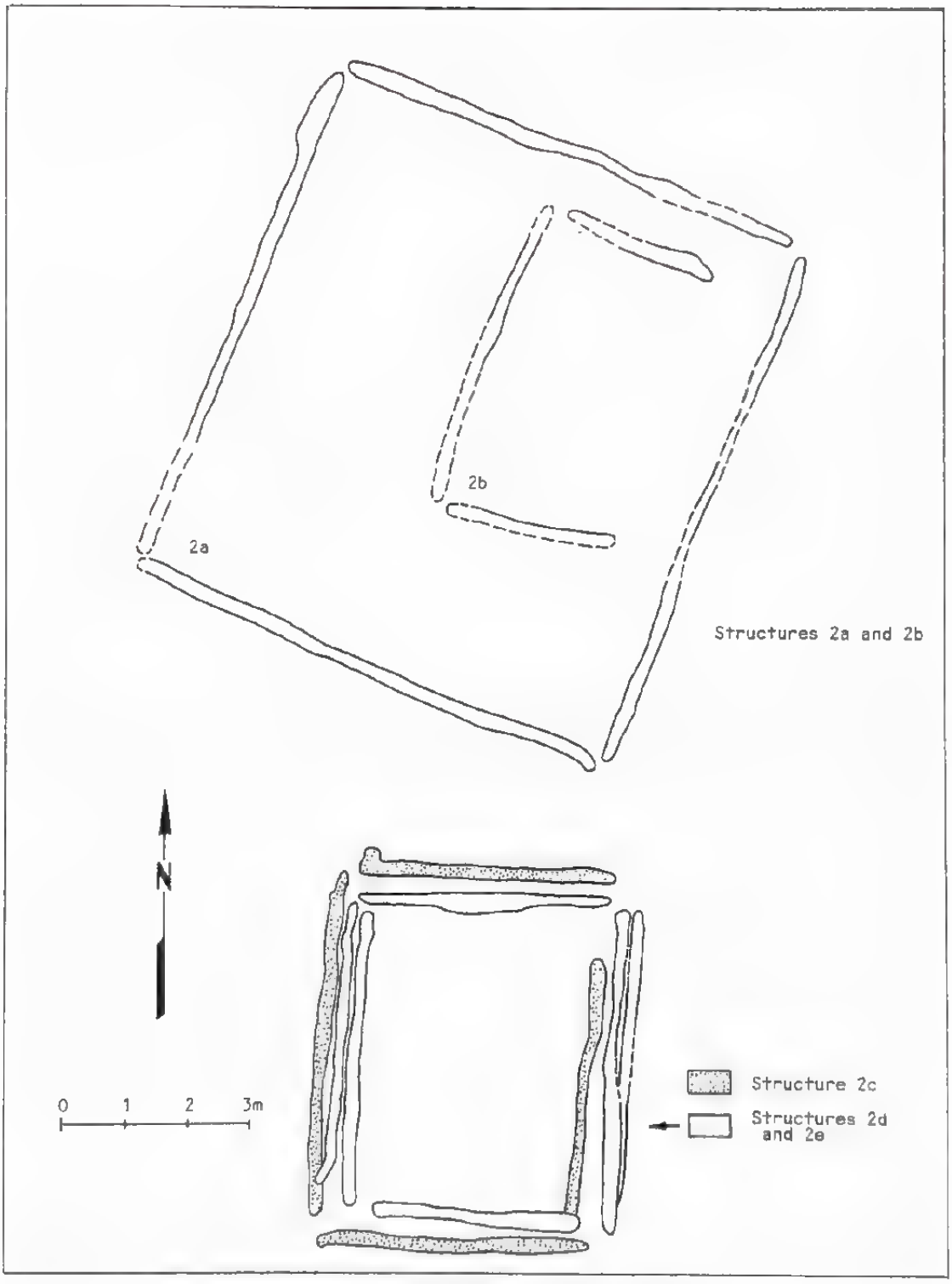


Figure 20. Construction episodes, Structural Complex 2.

(Figure 20). The earliest of these is Structure 2c (features 55, 61, 63, 64), which overlaps the northern and eastern wall trenches of Structure 2a. Although feature 65 could represent the eastern wall of this structure, it appears to be more clearly associated with the northern (feature 59) and southern (feature 58) wall trenches of Structures 2d-e. If this interpretation is correct, Structure 2c has a gap in the northeastern corner between two of its wall trenches similar to Structures 1a and 1b. The gap is approximately the same size (85 cm) as those associated with the other two structures.

As defined, Structure 2c has a maximum external north-south length of 6.0 m and a maximum east-west width of 4.25 m (25.5 m^2). The internal floor area measured 5.5 m north-south by 3.9 m east-west (21.45 m^2). The wall trenches ranged from 20 to 35 cm wide with a mean of 26.5 cm. Depth ranged from 20 to 35 cm below the stripped surface with a mean depth of 41.5 cm. The trenches varied in profile from straight sided (n=3) to sloping sided (n=1) while the bases were both flat (n=2) and rounded. One post mold (post mold 60) was defined in the cross-section cut through the northern wall trench (feature 63). The post mold was 19 cm in diameter by 42 cm deep and contained two fill zones, an upper 10YR 6/4 silty clay zone, 0-31 cm, and a lower 10YR 3/6 zone, 31-42 cm. Charcoal flecking was present in both zones. Cultural material was not recovered. The post was straight sided and round bottomed in profile.

Sixteen post molds (post molds 61, 65-68, 75, 76-83, 85, 91) were located within the interior of Structures 2c-e (Figure 16; Table 18). It could not be determined with which of the building episodes they were associated, and some actually may be associated with the large structure (2a). The post molds were confined largely to the western half of the interior, with only two post molds (75 and 91) located in the eastern half. Both small (post molds 61, 65-68, 75, 77-83, 85) and large (post molds 76, 91) posts were present. The small post molds ranged in diameter from 9 to 22 cm with a mean of 14.6 cm. Depth ranged from 10 to 34 cm. The fill within these posts ranged from a 10YR 3/4 dark brown to 10YR 3/4 dark yellowish brown, with charcoal and burned clay inclusions present in two post molds. Cultural material (two pieces of debitage and a shell-tempered sherd) was recovered from only two posts (post molds 66 and 75). The two larger post molds (post molds 76 and 91) were so much larger than the other post molds that they may be associated with Structure 2a. Post mold 91 was located in the southeastern corner of Structures 2c-e and was 30 cm in diameter with a defined depth of 31 cm. The post was sloping sided with a round bottom. Cultural material within the 10YR 3/4 charcoal flecked fill included four shell-tempered sherds and sandstone (11 g). Post mold 76 was a 31 cm diameter post located within a large basin (feature 57) that had been disturbed by the later construction of feature 75 (Figure 16). The post mold was located at the northern end of the basin, which appears to actually have been a ramp for the insertion of the post into the subsoil. The post contained a 10YR 3/3 dark fill and had a maximum depth of 31 cm beneath the stripped surface. It contained no cultural material. Post mold patterns within Structures 2c-e are difficult to interpret as it is not known with which of the rebuilding episodes a particular post may be

Table 18. Interior Post Molds, Structures 2b-e.

Post Mold	Maximum Diameter (cm)	Depth (cm)	Munsell Color (10YR)	Inclusions	Material	Comments
61	15	10	4/4			
65	26	22	3/4			
66	13	12	3/4		2 flakes	
67	9	5	3/4			Questionable
68	10	12	3/3	Charcoal, burned clay		
75	22	25	4/3	Charcoal, burned clay	1 shell-tempered sherd	
76	15	15	4/3			
77	10	5	4/4			
78	10	14	3/3			
79	12	17	4/4			
80	20	16	4/4			
81	20	12	4/4			
82	16	11	4/4			
83	20	34	4/3			
85	16	5	4/6			
91	30	31	4/3			

associated. Eight of the smaller post molds (post molds 68, 77-82, 83, 85) form a possible alignment along the western and southern structure walls, but post molds from several rebuilding episodes could be included in this group.

Two of the Structure 2d-e wall trenches (features 58 and 74) crossed two Structure 2c wall trenches (features 61 and 64). These two trenches provide the clearest evidence that Structures 2c-e do not represent the rebuilding and expansion of a single structure through time. Both of these wall trenches (features 58 and 74) are middle wall trenches on the east and west sides of the structure. If they were part of a rebuilding sequence, they should be either separate from or overlap the inner wall trenches and in turn be separate from or overlapped by the outer wall trenches (features 61 and 66). Instead, they overlap the outermost wall trenches indicating that they (the middle wall trenches) represent the final construction activity. This suggests that Structures 2c-e represent at least two separate overlapping structures that are oriented identical to each other and are approximately equal in size. Given the similar size and orientation of the structures, they probably represent the rebuilding activities of a single family over a relatively short period of time. However, similar to the rebuilding episode in Structural Complex 1, this rebuilding activity included the construction of a new structure in the same location as an earlier structure rather than a simple expansion in size.

As defined, Structure 2d-e has two west (features 62 and 74) and two east (features 65 and 66) wall trenches but only single wall trenches to the north (feature 59) and south (feature 58). If this definition is correct, Structure 2d-e was the only structure at the site rebuilt in place with additional wall trenches dug along the east and west sides of the structure. Structure 2d is comprised of features 58, 59, 66, and feature 62, while Structure 2e shares the same north and south trenches but has different east (feature 65) and west (feature 74) wall trenches (Figure 20). Structure 2d had exterior dimensions of 5.2 m north-south by 4.43 m east-west (23 m^2), while the interior measured 4.7 m by 3.3 m (15.51 m^2). Structure 2e had exterior dimensions of 5.2 m by 4.8 m (24.96 m^2), while the interior measured 4.7 m by 3.8 m (18.0 m^2). As a group, the six wall trenches ranged in width from 14 to 35 cm with a mean width of 23.3 cm. Trench depth ranged from 31 to 52 cm with a mean depth of 41 cm beneath the stripped surface. In profile, the trenches were straight (n=3) to sloping (n=3) with both round (n=4) and flat bottoms. Post molds (post molds 69, 74) were defined in the excavation trench profiles in one of the western (feature 74) and northern wall trenches (post mold 59).

The excavation trench wall profiles revealed that a house depression was associated with Structures 2d-e (Figure 17). The depression contained a mottled 10YR 3/6 to 4/4 silty clay fill and had a maximum defined depth of 10 cm. Small pockets of 10YR 3/4 dark yellowish brown fill between post mold 63 and feature 70 in the wall profile possibly represent the remains of house depressions associated with Structures 2a-e.

Internal Features. Four features (features 57, 69, 75, 76) were contained within Structures 2c-e (Figure 13). It is unclear with which of the structures these features are associated, but feature 69 was excavated through the western wall trench of Structure 2c, indicating that it postdates that structure. Feature 75 was an irregular deep pit measuring 70 cm northeast-southwest by 55 cm northwest-southeast by 30 cm deep. The northwestern edge of the feature was indeterminate as the feature intersected a basin (feature 57) associated with post mold 76 at this point. Feature 75 contained a 10YR 3/4 dark yellowish brown fill with small amounts of charcoal and burned clay scattered throughout. The feature was filled with domestic refuse, including a partial ceramic jar with a slightly everted rim and a smoothed body. A fragmentary large shallow bowl or pan was also present. Other artifacts within the feature included an arrow point, lithic debitage (n=11), three modified cobble tools, hematite (n=1; 1 g), sandstone (n=2; 4 g), and igneous/metamorphic rock (n=3; 3 g). A 10YR 3/3 homogenous dark brown fill layer containing charred botanical material was present in the center of the top of the feature. This fill zone was 28 cm in diameter by 8 cm deep. The broken shell-tempered jar was located upside down directly above this material, suggesting that the botanical remains may have been contained within the jar. Analysis of these remains revealed that 3.77 g of persimmon seeds (Diospryos virginiana), some with charred particles of flesh attatched, and 0.10 g of wood charcoal were present. Historic southeastern Indian groups made bread by drying and baking the skin and pulp of the persimmon (Swanton

1946:363), and the seeds in feature 75 may have been charred accidentally during this process and discarded. Flotation of a 10 liter sample from the remainder of the feature fill recovered 0.10 g of nutshell (Carya spp.), a common milkweed achene (0.06 g), and wood charcoal (0.70 g).

Feature 69 was a small refuse filled basin located in the northwestern corner of Structures 2c-e. This feature is described in detail in the next section of this chapter. The only exceptional characteristic of this feature was the recovery of a minute fleck of copper--the only example from the entire site--in the feature fill.

Feature 76 was the only hearth within Structural Complex 2 (Figure 16). The hearth was roughly oval, measuring 40 cm north-south by 32 cm east-west by 9 cm deep. The feature was basin shaped in profile, contained a 10YR 3/4 dark yellowish brown fill with charcoal on the surface, and had a layer of 5YR 5/8 yellowish red burned clay at the base. Cultural material was not recovered. Amorphous burned clay areas (feature 82) and an area of burned soil were located adjacent to and immediately southeast of the hearth. These may represent parts of the structure floor that were accidentally burned while the hearth was in use or, more likely, when the structure was destroyed by fire.

Artifact Distribution. Artifact distribution within Structures 2d-e was determined on the basis of individual pieceplots and the screened material from excavation units S2-11-13, 17-19, 23-25 (Tables 16 and 17). Similar to Structure 2a, the pieceplotted material consists of both numbered and unnumbered specimens (Figure 19). The unnumbered specimens were identified in the field and combined with the rest of the material from the unit. The numbered specimens were cataloged separately, and information regarding them is supplied in Table 16.

The pieceplotted artifacts included flake tools, chert debitage, rock, sherds, burned clay, modified cobbles, and groundstone tools. This material was largely restricted to the eastern side of the structure and over the northern and eastern wall trenches. The two groundstone artifacts--a probable plummet midsection and a flat sandstone saw--were located in the southeastern corner. The sandstone saw overlay the two eastern wall trenches (features 65 and 66), while the plummet fragment was located within the structure depression (Figure 19). A small cluster of material consisting of three igneous/metamorphic rock fragments, a modified cobble tool, and a sherd was present in the southwestern corner of the structure (Figure 16). Material was not recorded in the south-central part of the structure near the wall trenches or in the northwestern corner of the structure.

Unlike the pieceplotted artifact distribution from Structural Complex 1, the Structural Complex 2 distribution was supported by the screened data from the excavation units (Table 17). Material frequencies from the excavation units varied greatly, ranging from a low of three artifacts per 4 m^2 in unit S2-12 to a high of 115 artifacts per 4 m^2 in unit S2-13 with a mean of 57.2 pieces per unit. Units with

artifact frequencies above the mean were located above the southeastern (S2-13) and southwestern (S2-11) corners, along the eastern wall (S2-19), and above the center of the structure. The high artifact frequency (n=106) from the unit (S2-18) in the center of the structure is probably associated with the presence of the large refuse filled basin (feature 57) in this unit. Very low artifact frequencies were recorded for the units over the northwestern corner (n=7) and the south-central part of the structure along the southern wall trenches (n=3), areas where no material was recorded during the pieceplotting. The low frequency of material from the south-central unit (S2-12; n=3), in comparison to the units immediately west (S2-11; n=92) and east (S2-13; n=111) of it, could indicate that the southern corners of the structure functioned as activity areas. However, both of these units contained larger sections of the structure wall trenches than did the central unit, and the higher artifact frequencies in these areas could be associated with material contained within the wall trenches. No major differences in artifact distribution were apparent which would indicate the location of a food processing or other activity area.

In contrast to Structural Complex 1, where the burned clay fragments apparently represented part of the structure floor that baked during the fire that destroyed the structure, actual daub was associated with Structural Complex 2. Pieces of burned clay exhibiting stick and grass impressions were recovered in small quantities from unit S2-10 (n=1), S2-24 (n=2), and S2-25 (n=3). All are irregularly shaped with grass and stick impressions on one or more surfaces. The recovery of this small amount of daub may indicate that the smaller set of structures (2b-e) was partially clay covered.

Structure Summary

The excavation of the two structural complexes at the Bonnie Creek site provided detailed information regarding Mississippian structures in a small creek setting in interior southern Illinois. This information can be compared with that from other Mississippian sites in southern Illinois and with descriptions of historic southeastern Indian house types to determine the types of structures represented and how they relate in size and form to prehistoric structures in the larger stream drainages.

Botanical analyses of wood samples from both structures indicate that they were constructed with hardwoods (oak and hickory). As Zalucha (personal communication 1985) has noted, these are durable, resilient woods that were probably chosen for their rot resistant qualities. The use of oak and hickory as the primary building materials for Mississipian house construction has been noted at the Hill Creek Homestead site in the lower Illinois River valley (Asch and Asch 1985:130-133); for feature 2, a Sand Prairie phase structure at the Julien site in the American Bottom (Johannessen 1984:254); and at the Mike Adamson site in the Rend Lake Reservoir area (Lopinot 1986:218), among others.

Burned Mississippian structures with large sections of intact framework have been documented at the Rench site (McConnaughey 1985:171-193), the Hatchery West site in the Carlyle Reservoir area (Binford 1962), and the Turner and Snodgrass site in southern Missouri (Price 1969), among others. Of the three sites, the structures from the Carlyle Reservoir are the most similar to those of the Bonnie Creek site in terms of vertical wall pole diameter (5-10 cm), frameworks of crossed small diameter (3.5-5 cm) poles that Binford (1964) interprets as part of the structure walls, interior posts including deep centerposts, unpeeled structure poles, and possible entranceways into the structure. Frameworks of crossed small diameter poles were also present at the Turner and Snodgrass site, where they were interpreted as rafters and lathing (Price 1969:8-9). The information from the Bonnie Creek site supports Price rather than Binford in that small diameter poles were found in a mass over the structure center (indicating that they had fallen from the roof); small diameter poles were not found above the large wall poles as would suggest that they represented a framework lashed to the wall; the partial framework in the northwestern corner is associated with the large ash stain which covers most of the structure and which is interpreted as the structure roof. The deep central roof support post that Binford (1964:30-37) interprets as a characteristic of a gabled roof was also present in Structural Complex 1.

The interior floor area of the Bonnie Creek structures ranged from 18.0 m^2 to 64.6 m^2 with a mean of 29.2 m^2. If the floor areas of Structures 2d-e (which are unclear) are excluded, the mean interior floor area rises to 35.45 m^2. Regardless of which figure is accepted, both mean floor ranges are larger than those recorded for Moorehead (22 m^2) and Sand Prairie (25 m^2) phase structures at the Julien site in the American Bottom (Milner and Williams 1981:192, Figure 84). In terms of the Bridges site in the Kaskaskia River valley, the two mean interior floor areas are most similar to those of the Component C structures which had a mean interior floor area of 41.8 m^2 but a median of 35.9 m^2 (Hargave et al. 1983:170). Component C was suggested to date to A.D. 1300-1400 (Hargrave et al. 1983:170), which overlaps with and is later than the Mississippian occupation at the Bonnie Creek site (A.D. 1200-1350).

Structure 2a from the Bonnie Creek site was the largest structure (72.98 m^2) found in the Northfield mine area and is one of the larger structures found to date in the till plains (Table 14). Larger structures are known from beneath the Galley Pond Mound in the Carlyle Reservoir (Binford 1964) and from Component C at the Bridges site in the Kaskaskia River valley (Hargrave et al. 1983:166-168). Three structures from the Bridges site have interior floor areas (63.6-68.5 m^2) that are very similar to that of Structure 2a (64.6 m^2), while one has a much larger floor area (120.0 m^2). Hargrave et al. (1983:166) suggests that the large floor areas associated with Component C may reflect a change to an extended family residence pattern from A.D. 1300 to 1400. A second interpretation of large Mississippian structures is that they are public buildings rather than private residences. Milner (1984:180-195) suggested that a large (42 m^2) Moorehead phase structure at the Julien site had a ritual or public function, with the large number of arrow

points recovered from within the structure indicating that it may have been a men's house utilized by people from separate households. A third interpretation of large structures is that they are analogous to the historic southeastern Indian summer house as described in Swanton (1946) and Hudson (1976). Smith (1978) suggested that a 24.6 m^2 structure at the Gypsy Joint site which lacked an internal hearth was a summer house, while Conner (1985:207) suggested that an approximate 30 m^2 structure with an internal hearth at the Creek Homestead site might also be a summer house.

Of the three interpretations of large structures--extended family residence, public structure, or summer house--the one best suited to Structure 2a is the summer house. This interpretation is based on (1) descriptions of historic southeastern Indian summer houses, (2) the lack of a structure depression, (3) the absence of large roof support poles, (4) the site community pattern in which a structure with an internal hearth (presumably a cold weather house) is located opposite Structure 2a at the east end of the site, (5) the presence of typical household refuse within the structure and in the features surrounding it. If the structure was a men's house, it might be expected that debris within or near the structure would contain a disproportionate amount of male associated artifacts such as arrow points. This is not the case. A similar argument can be made against the structure having a ritual function. If it did, this function is not reflected in the cultural material recovered from within or near the structure.

The Bonnie Creek site plan is reminiscent of the description provided by Hudson (1976:213) of eighteenth century Creek, Cherokee, and Chickisaw households which ". . . typically consisted of clusters of buildings. At a minimum these consisted of a summer house and a winter house, and large households in some places added a third and even a fourth building for storage and other uses." The summer houses ". . . all had rectangular floor plans and gabeled roofs. The Chickisaws built theirs on a framework of rot resistant pitch pine or black locusts set into the earth. The roof was made out of a framework of saplings, cane, and white oak or hickory splints" (Hudson 1976:215). Hudson (1976) goes on to state that the whole structure was framed using clapboards split of cypress or pine, and sometimes the gable ends were left open for ventilation. Summer houses varied in size and construction throughout the south with the houses in warmer climates such as Louisisana and Florida being lightly built, sometimes consisting only of a roof with the house being open to all four sides (Swanton 1946:36). The summer houses of the more northern groups were more sturdily built, with the walls often completely enclosed except for an entranceway. The size of the summer house varied from group to group but appears to have been at least as large or larger than the winter house. In describing the Cherokee town of Chota in the Little Tennessee River valley in the 1760s, Lt. Henry Timberlake mentions that Cherokee houses--interpreted by Swanton (1946:403) as summer houses--measured 60 to 70 ft long by about 16 ft wide. These were constructed next to the "small hothouse" or winter house. These structures had closed walls and were sometimes two stories tall (Timberlake 1948:84-85). Swanton (1946:404) notes that

despite the size of these houses, they appear to have been occupied by "but one distinct family" group, presumably a nuclear family.

The wall profiles of the two excavation trenches through Structural Complex 2 revealed that a house depression was associated with the smaller set of structures (2b-e), while none was found with Structure 2a. Although house depressions may have been associated with warm weather structures, it appears more likely that their primary advantage would have been increased heat retention during the winter. The large size and lack of a defined hearth also argue for a warm weather use for Structure 2a. A large structure such as Structure 2a would have been difficult to comfortably heat without a sizeable hearth. The absence of such a hearth suggests that heating the structure was not a concern of the inhabitants.

If Structure 2a was a summer house, then the Structural Complex 1 houses (1a and 1b) may represent winter houses. An internal hearth was associated with this complex, and the large size and close spacing of the western wall poles of Structure 1b indicate that the structure was sturdily built. The recovery of a partially articulated deer skeleton with shed antlers from a large basin (feature 44) immediately adjacent to the structures also suggests a late winter occupation. The large basins (features 44, 80, 83, and 91) are discussed in greater detail in the feature section of this report, but essentially they are interpreted as the remains of large storage facilities later used for refuse disposal. The presence of two of the basins (features 44 and 93) immediately adjacent to Structural Complex 1 also supports a cold weather utilization of these structures. Two basins (features 80 and 83) also are located adjacent to Structural Complex 2, but these may be associated with the final building episodes (Structures 2b-e) in this complex rather than Structure 2a. An internal hearth also was located within Structures 2b-e which may represent a rebuilt winter house. A very small amount (n=6) of daub was recovered from the Structures 2b-e basin. This is far too small of an amount to conclude that the structure was clay covered, but the possibility exists. Additional daub may have been located above the shallow structure basin and destroyed by plowing or the mechanical stripping.

The interpretation of Structures 1a-b and Structure 2a as contemporaneous seasonal houses is in general agreement with the radiocarbon dates from the structures. The two adjusted radiocarbon dates from Structure 2a have a mean date of A.D. 1247±30 years, while Structure 1b has an adjusted date of A.D. 1302±30 years. If only the later date (A.D. 1280±30) from Structure 2a is used, the structure dates are separated by only slightly over 30 years.

The temporal position of Structures 2b-e is unclear. The structures must date to at least the early part of the fourteenth century as they were excavated through Structure 2a. Studies elsewhere in Illinois have revealed that the size of Mississippian structures changes through time. In the American Bottom, Mississippian structures steadily increase in size through time and reach their maximum mean size during the Sand Prairie phase (Milner 1984). In the lower Kaskaskia River valley,

however, Mississippian structures are largest during the Moorehead phase and decrease dramatically in size during the Sand Prairie phase (Hargrave et al. 1983). The approximate mean size of Structures 2b-e is in general agreement with the mean size of the Sand Prairie phase structures at the Bridges site. If the Bridges site pattern of increased house size during the Moorehead phase and decreased size during the Sand Prairie is valid for the Galum Creek valley, it could be that Structures 1a-b and Structure 2a are contemporary Moorehead phase structures while Structures 2b-e represent a final Sand Prairie phase occupation.

Pit Features

Ninety eight features were excavated at the Bonnie Creek site during the 1983 field season. Fifty two of these were structures, structural elements such as charred wall or roof poles, and wall trenches. The remaining features consisted of pits that had been excavated into the clay subsoil in conjunction with prehistoric activities such as food storage, cooking, and refuse disposal. These features were initially separated into four morphological classes on the basis of size, depth, and appearance in plan view: shallow basins, shallow pits, deep basins, and deep pits. All features with a defined depth of less than 30 cm were classified as shallow, while those with a depth greater than 30 cm were classified as deep. Features were classified as circular, oval, or amorphous based on their appearance in plan view, with the amorphous category containing features whose original appearance was undefinable due to disturbance by root or rodent activity or the construction of later features through them. Diameter in plan view was used to seriate the features as to size. Features with a diameter of 0-35 cm were classified as small, 36-75 cm as medium, and 76-100+ cm as large. Features were defined as either basins or pits based on their appearance in profile view. Basins were defined as those features in which there was no definable break between the feature walls and base. Pits, on the other hand, possessed distinct walls and bottoms.

Feature contents were used to define the function of the individual pit features. Specific pit feature types present at the Bonnie Creek site included smudge pits, cooking basins, refuse filled basins, and graves (Table 19). All of the Bonnie Creek features are interpreted as Mississippian features although only 1 of the 17 smudge pits contained culturally diagnostic shell-tempered ceramics. This interpretation is based on the known association of smudge pits with Mississippian occupations in southern Illinois, the presence of maize in most of the smudge pits and many of the other features, and the absence of pit features from earlier cultural occupations at the site. The recovery of Late Archaic/Early Woodland projectile points from three features (features 42, 47, and 91) probably is indicative of re-use of these earlier artifacts by the Mississippian site occupants as all three features also contained Mississippian artifacts.

The pit feature analysis had two objectives:

Table 19. Pit Feature Data.

Feature	Maximum Dimensions (cm)	Depth (cm)	Morphology	Shell-Tempered Ceramics #	Shell-Tempered Ceramics Wt(g)	Chert Debitage	Chert Tools	Other	Fauna #	Fauna Wt(g)	--Botanical (Wt in g)--- Nuts	Corn	Seeds	Wood	Possible Function
2	24 x 20	10	Shallow oval basin									22.50		0.20	Smudge pit
3	45 x 41	16	Shallow oval basin	5	10	2		A	3	1.0					Unknown
4	60 x 40	27	Shallow oval pit									x			Smudge pit
6	26 x 26	11	Shallow circular basin	2	15.5	1		B							Post
7	40 x 30	33	Deep basin	2	50	1						x			Unknown
30	150 x 81	10	Shallow pit					C	5	19.0					Grave
31	32 x 22	7	Shallow oval basin											x	Smudge pit (?)
32	45 x 25	22	Shallow amorphous basin									x			Smudge pit
33	70 x 50	25	Shallow amorphous pit								0.36	4.38	.08	8.50	Smudge pit
34	21 x 19	12	Shallow amorphous basin	1	9							0.10		1.36	Smudge pit
35	33 x 28	8	Shallow oval basin	1								45.79			Smudge pit
36	60 x --	22	Shallow amorphous basin	1	1									1.90	Unknown
37	35 x 30	14	Shallow circular basin								0.18	2.03		20.63	Smudge pit
38	36 x 34	11	Shallow amorphous basin								8.43			15.07	Smudge pit (?)
39	37 x 29	15	Shallow oval basin								0.33	9.84		1.19	Smudge pit
40	20 x 20	9	Shallow circular basin									x			Smudge pit
41	64 x 37	20	Shallow oval basin									4.44		60.09	Smudge pit
42A	155 x 100	22	Shallow oval basin	56	220	19	16	D	150	181		x			Storage/ cooking pit
42B	60 x 45	11	Shallow circular basin	5	3			E				x			Smudge pit (?)
43	30 x 30	11	Shallow circular pit						8	8.0	0.95	2.03		2.92	Smudge pit
44	107 x 96	14	Shallow oval basin	24	188	2	4	F	473	1002		x	.01		Storage pit
45	34 x 28	5	Shallow circular basin									x			Smudge pit
46A	16 x 12	7	Shallow circular basin									x			Smudge pit
46B	20 x 14	10	Shallow amorphous stain					G			0.07			6.26	Unknown
47	62 x 48	30	Shallow oval basin	4	2	8	1	H	14	1.0	0.80	0.72	.01	16.80	Cooking pit
48	30 x 25	21	Shallow oval basin								0.07			6.26	Cooking pit

x = indicates material noted as present in the field but not submitted for analysis

A = 2 sandstone
B = 2 I/M rock
C = 1 I/M rock
D = 2 abraders, 2 burned limestone, 5 sandstone, 1 I/M rock
E = 4 I/M rock
F = 1 I/M rock, 1 modified cobble tool
G = 1 modified cobble tool
H = 2 sandstone, 1 I/M rock

Table 19. (cont'd).

Feature	Maximum Dimensions (cm)	Depth (cm)	Morphology	Tempered Ceramics Grit #	Grit Wt(g)	Shell #	Shell Wt(g)	Chert Debitage	Chert Tools	Other	--Fauna--- #	Fauna Wt(g)	---Botanical(Wt in g)-- Nuts	Corn	Seeds	Wood	Possible Function
49	64 x 40	14	Shallow oval pit														Smudge pit (?)
50	17 x 14	4	Shallow circular basin										x				Natural
51	33 x 30	9	Shallow circular basin											x	1+		Smudge pit (?)
52	50 x 40	9	Shallow oval basin										2.80				Smudge pit (?)
53	40 x 30	15	Shallow oval basin														Unknown
54	35 dia.	10	Shallow amorphous basin			1	13						-				Smudge pit (?)
57/75	70 x 55	33	Deep oval pit	2	3.0	10	74	6	4	I					3.83		Refuse pit
69	45 x 35	10	Shallow oval basin							J							Hearth (?)
77	40 x 38	9	Shallow basin													x	Smudge pit (?)
80	170 x 150	13	Shallow circular basin			66	309	10		K							Storage pit
81	73 x 55	21	Shallow oval basin			5	19	2	2	L							Unknown
83	120 dia.	13	Shallow circular basin	3	8.0	5	44	3	1	M							Storage pit
88	45 x 38	8	Shallow circular basin											x			Smudge pit
89	30 x 24	4	Shallow circular basin										x	x			Smudge pit (?)
90	17 x 14	7	Shallow circular basin											x			Smudge pit
91	130 x 103	14	Shallow oval pit			313	114	4	7	N	76	65.0	0.95	2.03		2.92	Storage pit
92	46 x 33	14	Shallow oval pit											x			Smudge pit
93	55 x 34	10	Shallow oval basin			6	57	1			23	9.00		-			Cooking pit
94	48 x 40	6	Shallow oval basin														Unknown
95	39 x 30	13	Shallow oval basin														Unknown

x = indicates material noted as present in the field but not submitted for analysis

I = 3 I/M rock, 2 sandstone, 1 limonite, 3 modified cobble tools
J = 2 sandstone, 7 limestone, 1 I/M rock, 1 copper fleck
K = 6 modified cobble tools, 1 I/M rock
L = 1 limonite, 2 limestone, 1 modified cobble tool
M = 2 sandstone, 2 limonite
N = 3 sandstone, 1 limestone, 2 I/M rock, 4 limonite

1. Delineation of pit feature types associated with Mississippian occupations in the upper Galum Creek valley. Unlike other sites (21C4-14, -29, -34, and -35) in the area at which Mississippian occupations were identified, the Bonnie Creek site is a single component site with no significant earlier occupations present, and all pit features are believed to be associated with the Mississippian occupation.

2. A determination of the types of prehistoric activity that occurred in the upper Galum Creek drainage based on an anlysis of the various functional pit feature types present at the Bonnnie Creek site and their material contents.

In the following section, a general description of each feature class is presented followed by detailed descriptions of the individual features comprising each class. The material contents, location, dimensions, and other data in regard to tne pit features is presented in Table 19.

Smudge Pits (n=17)

Smudge pits are defined here in accordance with the basic criteria provided by Binford (1972:37-45). According to Binford, smudge pits are small pits excavated into the subsoil that contain a basal layer of charred twigs overlain by a layer of charred corncobs. The upper part of the pit is filled with grayish loam indicating an intentional filling of the pits and its contents (Binford 1972:380). Binford has documented convincingly the use of this type of facility by historic Indian groups for hide smoking although Munson (1969) suggested that they may also have been used to smudge ceramic vessels. Smudge pits are a common feature type at Mississipian sites in the till plains and have been found at the Toothsome (Binford 1964) and Texas (Morrel 1965) sites in the Carlyle reservoir area; at the Reiling and Mike Adamson sites (Wagner and McCorvie 1986) in the Rend Lake reservoir area; at the Marty Coolidge (Kuttruff 1972) and Bridges (Hargrave et al. 1983) sites in the lower Kaskaskia River drainage; and at the Galum Crossing (Powell n.d.) and Cutler sites in the Galum Creek valley in Perry County, Illinois, among others.

Features 2 and 4 were the only smudge pits located during the excavation of the 2 x 2 m units. Feature 2 (Table 19) was first defined at the base of the plow zone (23 cm bs) in unit N260E180 as a diffuse gray stain against the yellowish brown sterile clay. The feature was oval in shape, measuring 47 cm east-west by 40 cm north-south. Material was not observable on the surface of the feature, and it was initially interpreted as a rodent burrow. Upon cross-sectioning, the feature was found to be a small oval basin containing a central concentration of intact charred corncobs (22.5 g) and wood (0.2 g) resting on the base of the feature. This concentration was covered by a 10YR 4/4 dark yellowish brown silty loam that was much darker than the gray soil at the surface of the feature and which measured 24 cm east-west by 20 cm north-south. Small flecks of burned clay and one fleck of calcined bone were observed in the fill. Cultural material was not present. Feature

2 (except for the relative lack of wood charcoal) conforms exactly to Binford's (1972) data regarding historic smudge pits. The charred corncobs represent the fuel, while the large gray stain located over the smaller pit is interpreted as soil stained by the smudge smoke.

Feature 4 (Table 19) was similar in its initial appearance to feature 2, being defined as a diffuse gray stain against the yellowish brown clay subsoil at the base of the plow zone (25 cm bs) in unit N250E180. The feature measured 60 cm north-south by 38 cm east-west at this point. When troweled, however, the feature decreased in size until it was redefined as an oval stain measuring 50 cm north-south by 29 cm east-west that contained a 10YR 4/4 yellowish brown silty clay fill. In profile, the feature was defined as a shallow pit with burned clay and calcined bone flecks scattered very lightly throughout the fill. A concentration of charred wood was located at the south end of the feature along its base, with intact charred corncobs directly overlying this material. A large (ca. 5 cm diameter) pole was located in the center of the feature along its base, and a second but more diffuse concentration of charred wood and corncobs was located along the northern base of the feature. The majority of the charred material was located in the lower (30-37 cm bs) half of the feature, while the upper (20-30 cm bs) part of the feature contained a 10YR 4/4 gray fill with only very slight charcoal flecking present. One small fragment of shell-tempered pottery was recovered from the feature.

Feature 32 (Table 19; Figure 21) was defined during the mechanical stripping as a kidney shaped 10YR 4/4 stain with intact corncobs on the surface of the feature. In profile, it resembled features 2 and 4, with a concentration of ashy soil, charred wood, and corncobs located in the lower part of the basin. The upper part (0-10 cm bs) of the feature was a 10YR 4/4 dark yellowish brown silty clay containing a few scattered corncobs. Cultural material was not present.

Feature 33 (Table 19) was defined on the stripped clay surface as a cluster of charred corncobs with no definable feature outline. In profile, the feature appeared as a shallow, irregularly shaped pit containing at least two separate concentrations of charred wood and corncobs along its base (Figure 22a). The main concentration was located at the base of the center of the feature and consisted of a 28 cm long by 5 cm thick layer of charred wood overlain by a ca. 5 cm thick layer of ash and intact corncobs. Covering both of these layers was a 15 cm thick stratum of 10YR 6/3 pale brown silty clay containing a light scattering of ash and isolated corncobs. The second concentration was located along the western edge of the pit, again at the feature base. This concentration of 4/3 to 4/4 dark yellowish brown silty clay with charcoal, ash, and burned clay was much smaller than the first and consisted of an approximate 10 cm long layer of mixed corncobs and wood charcoal overlain by a ca. 10 cm thick layer of ash. A 10 liter flotation sample from the southern half of the feature produced 8.56 g of wood, 4.38 g of corn, and 0.36 g of nutshell. Cultural material was not recovered from the feature.

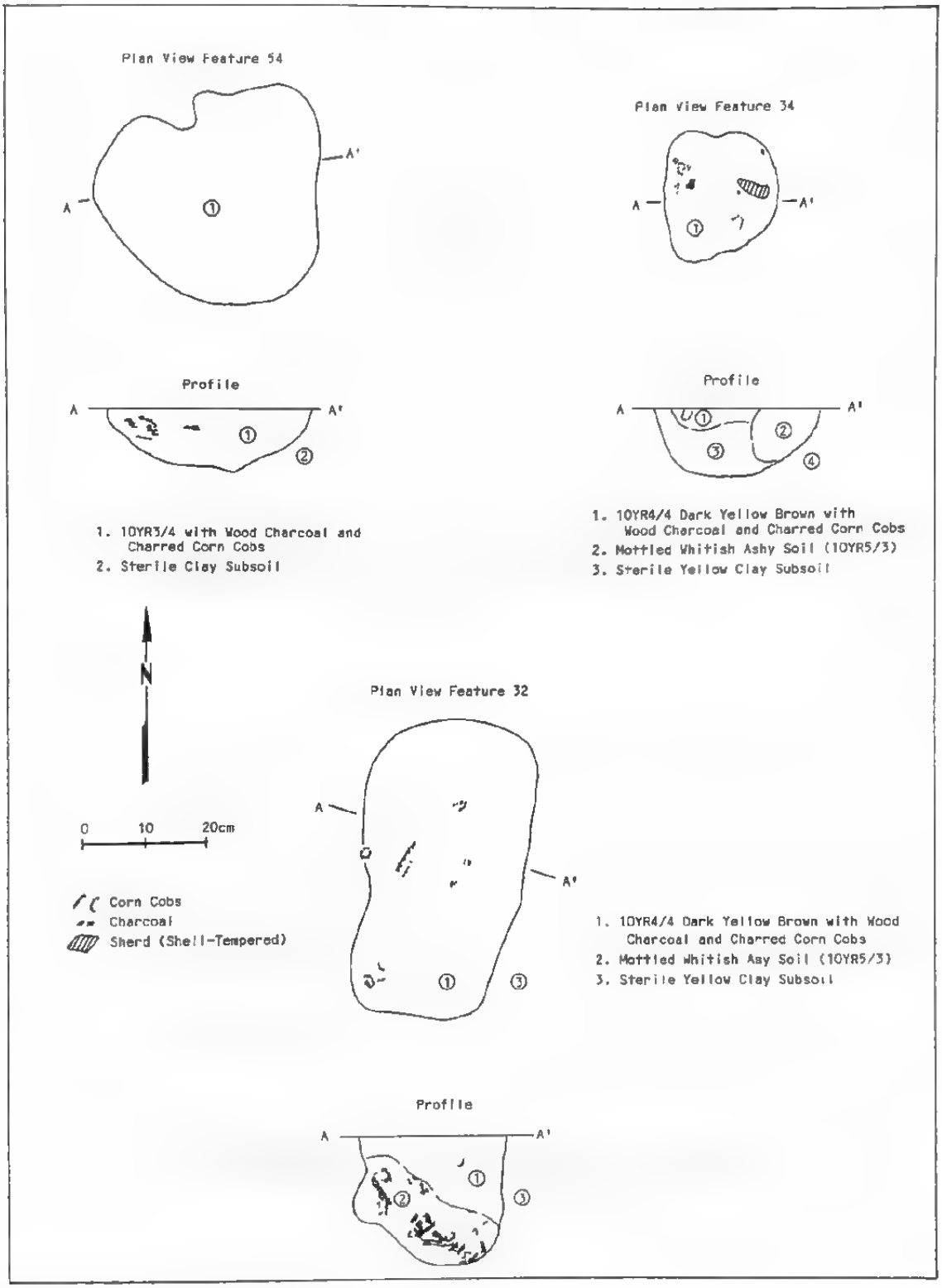


Figure 21. Smudge pits.

Figure 22a. Profile view, feature 33.

Figure 22b. Profile view, feature 40.

Feature 34 (Table 19; Figure 21) is interpreted as the base of a smudge pit with the upper portion of the feature having been removed by the mechanical stripping. The feature was defined in plan view as an irregular dark brown stain containing a mixture of ashy soil, charcoal, and charred corncobs. In profile, the feature appeared as a shallow (12 cm) basin containing a 10YR 4/3 to 4/4 dark yellowish brown silty clay with charcoal, burned clay, ash, and corncobs present in the fill (Figure 21). Two concentrations of ash and wood charcoal were present in the fill, one in the center of the feature along the base and one in the top 8 cm of fill along the eastern edge of the feature. A flotation sample (4 liters) consisting of one half of the feature fill contained 1.36 g of wood charcoal and 0.1 g of corn, a ratio to be expected if feature 34 does indeed represent the lower fuel layer of a smudge pit.

Feature 35 (Table 19) was located approximately 5.20 m northeast of Structural Complex 2. The feature was defined in plan view as an oval concentration of 10YR 4/4 to 5/4 silty clay with intact corncobs and white ash present on the surface of the feature. In profile, the feature appeared as a shallow (8 cm) basin with a dense concentration of charred corncobs and white ash covering the bottom 4 cm of the feature along its western edge. The remainder of the feature contained a 10YR 4/4 silty clay containing a light scattering of charcoal and ash. The flotation sample from the feature consisted almost entirely of charred corn remains (47.25 g). Cultural material was not recovered.

Features 37 and 39 (Table 19) were initially defined as an area of ashy soil and corncobs (feature 37) measuring 80 cm northeast-southwest by 42 cm northwest-southeast. When the feature was cross-sectioned along its long axis, it became evident that feature 37 actually consisted of two smudge pits, with the large area of ashy soil being similar to the discolored soil areas found above features 2 and 4. Feature 37 was redefined as a shallow circular basin with a concentration of charred wood and corncobs located in a 15 cm wide area along the western base of the feature. The soil surrounding this concentration was a 10YR 4/4 dark yellowish brown silty clay with burned clay and charcoal flecks present in the feature profile. The remainder of the basin was filled with a charcoal flecked 10YR 4/4 silty clay that was slightly lighter than the fill surrounding the carbonized material in the western part of the feature. Although separate corn and wood layers were not defined during the excavation of the feature, the flotation analysis revealed that the majority of the charred botanical material was wood (20.51 g), while corn made up 2.03 g of the sample. A small amount (0.30 g) of nut remains was also present. Cultural material was not present in the feature. Feature 39 was located 16 cm northeast of the redefined feature 37, with a scattering of charred corncobs located between the two pits. Most of this feature was located beneath the area of ashy soil, corncobs, and charcoal that was originally defined as feature 37 although it extended slightly beyond the limits of this stain to the northeast. Feature 39 was defined as a shallow oval basin filled with charred corncobs surrounded by ash. Similar to feature 37, separate layers of wood and charred corncobs were not observed during the excavation of the feature, which appeared to contain only corncobs. The flotation analysis, however, indicated that while corn was the most

prevalent (9.84 g) botanical material, a small amount of nutshell (0.45 g) and wood charcoal (0.13 g) was also present. Cultural material was not recovered from the feature.

Feature 40 (Table 19; Figure 22b) contained one of the densest concentrations of charred corncobs of any of the smudge pits. The feature was defined on the stripped clay surface as a circular concentration of ash and intact corncobs with at least 10 complete corncobs present on the surface of the feature. In profile, the feature appeared as a shallow basin (9 cm) with a concentration of wood charcoal and dark gray to black ash located in the center of the feature together with a few isolated corncobs. White ash containing a few corncobs was located along the sides of the feature. The dense concentration of corncobs and white ash observed on the surface of the feature was confined to the top 2 cm of the basin and was located directly above the layer of dark gray ash. Cultural material was not recovered from the feature.

Feature 41 (Table 19) was a shallow oval basin that was defined on the stripped clay surface as an area of 10YR 6/3 ashy silt loam. Corncobs or burned wood were not observed on the surface of the feature. In profile, however, a dense (ca. 5 cm thick) layer of wood charcoal covered a 20 cm long area at the base of the feature along the western side. Small pieces of burned clay were located above and to the east of the wood charcoal layer. The area above the wood charcoal was filled with the ashy silt loam observed on the surface of the feature, with a small amount of charcoal flecking present. A small cluster of corncobs was present along the base of the feature approximately 10 cm east of the wood charcoal layer, and a small concentration of wood charcoal, dark gray ash, and corncobs was located along the extreme eastern edge of the feature. The botanical analysis revealed that only corn (4.44 g) and wood (60.09 g) were present in the feature fill. The feature appears to originally have contained the following strata:

1. A basal layer of wood that burned away to form a gray ash except along the western side of the feature where the wood was only partially consumed.

2. A layer of corncobs was located above the wood. These burned away to form a white ash except in the center of the basin and along the eastern edge.

3. A top layer of ashy silt loam that contained no cultural material. The ashy texture of the soil suggests that it was either placed in the feature while the contents were still smouldering or that the soil surrounding the mouth of the feature became ashy during the smudging process and then washed into the basin naturally.

Feature 43 (Table 19) is interpreted as the basal remnant of a smudge pit that was largely destroyed during the mechanical removal of the plow zone. The feature was defined as a circular gray stain with both charred corncobs and wood fragments observed on the feature surface. The feature was very shallow (5 cm) in profile except for a

slight projection in the center of the feature that extended to 11 cm below the stripped surface. Distinct layers of wood charcoal or corn were not observed during the excavation of the feature. The botanical analysis indicated that charred corn (2.03 g), wood (2.92 g), and nuts (0.95 g) were present in the feature fill. Cultural material was not recovered.

Feature 45 (Table 19) was located south of Structural Complex 1 and was defined in plan view as a circular stain containing light gray ash, wood charcoal, corncobs, and a fragmentary section of a deer jaw. In profile, the feature was defined as a very shallow (5 cm) basin with a deposit of dark gray ash and wood charcoal located at the base of the feature. Culturally diagnostic material was not recovered.

Feature 46 (Table 19) was originally defined as a single feature, a large gray stain measuring 75 cm northeast by 51 cm southwest with a smaller dark area containing corncobs located at the northeast end. Charcoal fragments were lightly scattered throughout the larger stain. In profile, however, the small dark stain was defined as a shallow corncob-filled smudge pit (feature 46a), while the large gray stain (feature 46b) had a very irregular bottom ranging in depth from 1 to 5 cm beneath the stripped surface. Feature 46a had a defined depth of 7 cm and contained two zones, an upper layer 1 to 2 cm thick consisting of charred corncobs and dark gray ash, and a lower layer of 10YR 5/6 yellowish brown silty clay mixed with gray ash. This lower layer may represent leaching of the smudge pit contents into the subsoil. The function of feature 46b is unclear. The feature was irregular in both plan and profile view and consisted entirely of a gray ashy stain with a light scattering of charcoal and corn fragments. One igneous/metamorphic cobble was present on the surface of the feature. One possibility is that feature 46b represents soil that was discolored by smudging activities connected with feature 46a.

Feature 51 (Table 19) was defined in plan view as a circular stain containing a combination of dark gray ash, white ash, charcoal fragments, and corncobs. In profile, the feature appeared as a shallow basin with a concentration of wood charcoal and corncobs located in the center of the feature and isolated wood fragments and corncobs scattered along the eastern and western edges of the basin. The feature did not contain distinct layers of wood charcoal and corncobs. Cultural material was not recovered.

Feature 88 (Table 19) was located south of Structural Complex 1. Most of the feature had been removed during the mechanical stripping, with only 8 cm remaining. In profile, the feature appeared as a shallow basin with a layer of dark soil located at the feature base. Wood charcoal, corncobs, and nut remains were recorded during excavation in the upper portion of the basin. However, the flotation sample consists almost entirely of hickory and walnut shells, with only a small amount of wood charcoal. Cultural material was not recovered.

Feature 90 (Table 19) was located west of Structural Complex 1 and was heavily disturbed by the mechanical removal of the plow zone. The

feature was defined as a light scatter of charcoal and corncob fragments contained within a circular gray stain. The feature was very shallow (7 cm) in profile, with the charred botanical material confined to the upper 2 cm of the feature fill. The lower feature fill consisted of a yellowish brown to gray silty clay containing a slight amount of charcoal. Cultural material was not recovered.

Feature 92 (Table 19) was a small oval smudge pit located south of Structural Complex 1. The feature contained a 10YR 4/4 dark yellowish brown fill with a concentration of charred corncobs and wood located at the base of the feature along its western edge. Distinct layers of corncobs and wood were not observed. Cultural material was not recovered from the feature.

Possible Smudge Pits (n=7)

In addition to the 17 smudge pits, an additional seven features were identified as possible smudge pits (Table 19). These features are similar to the 17 smudge pits but lack one or more of the formal characteristics of this feature type as defined by Binford (1972). In several cases, these features appear to be the basal remnants of smudge pits that were truncated either by plowing or by the mechanical removal of the plow zone, making a positive identification of feature type difficult. In terms of overall morphology, however, they are more similar to the identified smudge pits than any of the other feature types at the site. Feature 31 (Table 19) was a very shallow oval basin containing a 10YR 4/2 dark grayish brown fill mixed with charcoal fragments and ash. Corncobs were not noted during the excavation of the feature. Feature 31 may represent the basal fuel layer of a smudge pit that has been largely stripped away. Cultural material was not found in this feature.

Feature 38 (Table 19) was very similar in appearance to feature 31. The feature was defined in plan view as an oval stain containing a 10YR 5/2 grayish brown ashy silty clay. In profile, the feature greatly resembled the lower fuel layers found in smudge pits such as features 2 and 4, with a concentration of dark gray ash and wood charcoal located along the eastern base of the feature. A layer of charcoal flecked 10YR 5/2 silty clay was located above this layer in the western part of the feature. Cultural material was not recovered.

Feature 49 initially was defined as a large oval smudge pit with two concentrations of charcoal on the surface. In profile, the feature contained a 10YR 3/3 dark brown fill with a 30 cm long by 10 cm thick concentration of wood charcoal and dark gray ash in the northern half of the profile. A second concentration of 10YR 2/2 dark grayish brown ash was located along the southern edge of the feature. A cursory examination of the flotation sample indicated that it consisted largely of wood charcoal with some nut remains. Maize was not present. Feature 49 may represent the basal layers of two smudge pits with the upper layer of maize having been removed during the mechanical stripping.

Feature 52 (Table 19) was an oval, irregularly-bottomed basin containing a 10YR 5/4 silty loam fill. Cultural material was not present. A small concentration (2.80 g) of charred hickory nutshells was present in the approximate center of the feature. The feature may represent the basal layer of a smudge pit in which nuthulls were used for fuel instead of wood.

Feature 54 (Table 19; Figure 21) was a shallow oval basin containing a 10YR 3/4 dark yellowish brown fill. Charcoal flecks and burned clay were lightly scattered throughout the fill, with a slight concentration of charcoal in the western half of the feature. Although no layers of charcoal or corncobs were present in the fill, feature 54 is very similar in shape and fill to the smudge pits. One shell-tempered sherd was present in the fill.

Feature 77 (Table 19) was a shallow basin largely destroyed by the construction of the south wall (feature 56) of Structure 2a (Figure 10). The feature had a defined depth of 9 cm with large pieces of charcoal located within the fill. Cultural material was not recovered from the 10YR 3/3 dark brown fill.

Feature 89 (Table 18) was a very shallow basin (4 cm) located 1.65 m northwest of Structural Complex 1. The feature contained a 10YR 3/4 yellowish brown clay mixed with a small amount of charcoal and ash similar to that contained within some of the smudge pits. Cultural material was not recovered from the feature. Feature 89 may represent the very base of a smudge pit.

Graves (n=1)

The single grave (feature 30) found at the Bonnie Creek site was located 10.5 m northwest of Structural Complex 1 (Figure 10). Other pit features were not located in the vicinity of the grave, with the closest feature located 4 m away. The presence of feature 30 was first suspected when several large pieces of limestone were uncovered in the plow zone during the mechanical stripping. Although limestone had been found in other areas of the site, it always occurred as small fragments and not as slabs. The location was scraped a second time, after which human bone and limestone fragments were found scattered over an approximate 10 m x 10 m area of the plow zone. The occurrence of human bone fragments and limestone in the plow zone indicated that the grave had been disturbed by plowing. As no feature outline was discernible, the scraper was used to remove the remainder of the plow zone down to the sterile clay subsoil. Feature 30 was defined at the level of the clay subsoil as a linear dark midden filled stain oriented north-south. The feature measured 1.5 m north-south with a minimum width of 30 cm at the southern end. The feature gradually expanded in width, reaching a maximum width of 81 cm near the northern end of the grave. The grave consisted of a flat-bottomed pit with a maximum depth of 10 cm.

The partial remains of an adult male were contained within the grave (Table 20). The burial had been badly disturbed by plowing and the mechanical stripping. The occurrence of several sets of bones in

Table 20. Burial 1 Skeletal Material.

Interment		Plow Zone	
1	Distal half of left femur	1	Femur head fragment
1	Fragmentary right tibia	3	Vertebral fragments
1	Fragmentary left tibia	1	Left scapula fragment
1	Fragmentary right fibula	1	Rib fragment
1	Fragmentary left fibula	1	Left zygomatic arch fragment
2	Right calcaneus fragments	1	Right parietal fragment
1	Right cuboid	11	Misc. parietal fragments
1	Right first cuneiform	25	Misc. longbone fragments
1	Cuneiform fragment		
1	Right first metatarsal distal fragment		
1	Right second metatarsal proximal fragment		
1	Right third metatarsal proximal fragment		
1	Proximal pedal digit		
2	Medial pedal digit		
1	Scapula fragment		
4	Rib fragments		
20	Miscellaneous bone fragments		
Age: Adult			
Sex: Male			

anatomically correct position (a radius next to an ulna; a partial tibia next to a partial fibula) indicated that the skeleton was at least partially articulated at the time of burial. The length (1.5 m) of the grave suggests that the burial may have been fully extended. Limestone slabs were not found in association with the grave, but the occurrence of limestone slabs in the plow zone over the feature leaves little doubt that the grave was at least partially constructed of this material. Burial offerings were not found in the grave. A small amount of faunal material (19 g) and rock (19 g) was present, but these were probably inclusions within the midden used to fill the grave.

The skeletal material (burial 1) within the grave was analyzed by Mary R. McCorvie. All cranial fragments had been removed by plowing, but 12 parietal fragments and a zygomatic arch were recovered from the plow zone during the mechanical stripping. Portions of the postcranial skeleton were recovered from both the grave and the plow zone and consisted of the large long bones of the lower extremities and vertbrae and rib fragments. An age assessment for the burial was determined solely on the basis of epiphyseal union. Due to the very fragmentary nature of the burial, a more exact age determination than "adult" was not possible. All of the long bones had completely joined diaphyses and epiphyses, indicating an age in excess of 23 years (McKern and Stewart

1957:45,52). A groove was present on some of the proximal tibiae fragments. According to McKern and Stewart (1957:49), a well-marked groove may persist for up to 14 years after complete union has occurred.

The sex of burial 1 was determined based on the total morphological pattern of the skeletal material and Black's (1978) discriminate function analysis of the femoral shaft circumference. Those features of the cranium that are most useful for determining sex (e.g., rugosity of the supraorbital ridges and muscle markings) were missing from burial 1. Based solely on thickness, the parietal fragments resemble those of a male. Similar to the cranium, most of the traits used to determine sex from postcranial remains could not be examined due to the incompleteness of burial 1. The single metric trait that could be taken was the circumference of the femur. The left femur measured 94 mm which, according to Black (1978), is well within the male range.

Slight marginal osteophytes were present along the margin of the medial and lateral condyles of the left femur accompanied by erosion and pitting of the condylar surface adjacent to the hypertrophic bone. The knee is the articulation that is the earliest and most often involved in degenerative joint disease, and significant bone changes usually develop some time after the onset of degenerative and proliferative cartilage change. These ususally begin at the margin of the articular cartilage and manifest themselves as marginal lipping and exostosis (Ortner and Putschar 1981:419-420). These degenerative changes usually occur after the fourth decade of life, and their presence on burial 1 suggests an age in excess of 40 years.

Two post-mortem anomolies in the form of circular holes that completely penetrate the cortical bone are present on the distal left femur. The first is located on the anterior portion of the diaphysis and measures 3.4 mm in diameter. The second is located anteriorly near the metaphysis and is slightly conical, almost as if it had been drilled. This hole measures 9.1 mm on the outside and 6.6 mm on the inside. It is unknown whether these holes were inflicted aboriginally or are modern in origin. Given the diameter and shape of the holes, it is possible that they were created by a vandal using a metal rod to probe the grave. Local informants indicate that metal rods were used to probe graves at the Mississippian cemetery (21C4-9) in the project area. The presence of human bone and limestone in the plow zone above the grave may have led artifact collectors to use a similar technique in an attempt to locate burial 1.

The occurrence of isolated graves at Mississippian habitation sites has been documented at other sites in the project area (21C4-29 and 21C4-34) and at the Bridges site in the Kaskaskia River valley (Hargrave et al. 1983:93-97). Although 40 separate building episodes were present at the Bridges site, only a single stone construction grave containing a minute amount of skeletal material was found. The relative absence of skeletal material within the grave led the authors to interpret the grave as a preliminary processing facility and not a place for final interment. Two Mississippian structures and two graves were found at the Galum Crossing site (21C4-29), a Mississippian site approximately

1.5 mi northwest of the Bonnie Creek site. Two empty stone graves containing no skeletal material were also found at the Cutler site (21C4-34), a Mississippian site located on a heavily forested ridge spur less than a mile south of the Bonnie Creek site. One of these graves was completely removed by the backhoe used to clear the site, but examination of the slabs and associated soil in the backhoe bucket revealed no skeletal material. The second grave (feature 9) was discovered intact and consisted of a small rectangular box made from slate with no top or bottom stones. This grave appeared to be completely undisturbed. Skeletal material, however, was not recovered in either the screened or flotation samples from the grave. The occurrence of isolated Mississippian graves at three habitation sites in the project area, together with the presence of empty graves at two of these sites, suggests that deceased individuals may have been initially buried at the habitation sites and then moved to another location such as the large Mississippian cemetery (21C4-9) at a later time.

Possible Cooking Pits (n=3)

Three features (features 47, 48, and 93) were identified as probable cooking facilities. Only one of these features (feature 93) contained evidence of *in situ* burning in the form of charred material at the base of the feature. Features 47 and 48, however, contained a very dark, rich fill with large pieces of charcoal and burned clay scattered throughout, suggesting use as a cooking facility.

Features 47 and 48 were shallow oval basins located immediately adjacent to each other approximately 1.8 m west of Structural Complex 1 (Figure 10). Feature 47 (Table 19) was defined in plan view as a dark grayish brown oval stain with charcoal and burned clay flecks present on the feature surface. The feature had a defined depth of 21 cm. The fill was a very homogenous 10YR 3/2 to 3/3 dark grayish brown silty clay with several large pieces of burned clay and charcoal scattered throughout. Although no *in situ* burning was observed, the dark gray soil within the feature was very similar in color and texture to the burned soil found in many of the smudge pits. Artifacts within the feature consisted of a Woodland projectile point, four shell-tempered sherds, and lithic debitage (n=8). Other material within the feature included burned clay (7.9 g), sandstone (2 g), limonite (1.8 g), one igneous/metamorphic cobble, and faunal remains (n=4). The botanical material within the feature also indicated that burning may have occurred in feature 47, with wood charcoal (16.88 g) comprising most of the remains followed by nuts (0.79 g), maize (0.72), and dwarf sumac seeds (0.01 g).

Feature 93 was located immediately south of Structural Complex 1. The feature was oriented north-south and contained a layer of charred botanical material along its base. The feature was secondarily used for refuse disposal, with shell-tempered ceramics and faunal remains contained in the upper portion of the feature.

Large Shallow Basins/Pits (n=5)

These were by far the largest diameter pit features at the site, with the orifice measurements ranging from a minimum of 1.07 m x .96 m to a maximum of 1.70 m x 1.50 m. The mean for all five features was 1.36 m x 1.13 m. Based on their spatial locations, two of these basins (features 80 and 83) appear to be associated with Structural Complex 2, while features 44 and 91 appear to be associated with Structural Complex 1. The remaining feature (feature 42a) is located almost equidistant between the two structures. None of these features contained evidence of burning in the form of oxidized walls or floors or large amounts of burned clay or charcoal. This is not surprising as, given their large diameters, these features would have been relatively inefficient for retaining heat. Based on their large size and (in four cases) proximity to the structures, it appears more likely that these five features represent storage facilities that have had their original contents removed. Evidence to support this interpretation was not found, with all of the features containing varying amounts of cultural debris.

Feature 42 (Table 19) was located 7.90 m west of Structural Complex 1 and 6.40 m northeast of Structural Complex 2. The feature was very difficult to define in plan view due to extremely dry soil conditions. It was initially mapped as a large amorphous concentration of 10YR 4/4 dark brown soil with a very high frequency of burned clay, charcoal, faunal material, and shell-tempered sherds exposed on the feature surface. A bulbous projection was located on the northern side of the feature; upon excavation, this was found to be a smudge pit (feature 42b) that had been intersected by the larger basin feature (feature 42a). Feature 42a was redefined as a large shallow oval basin oriented east-west with a maximum depth of 22 cm (Figure 23). The feature fill was very similar to that of feature 94, being a dark brown to dark grayish brown silty clay with charcoal and burned clay scattered throughout the fill. Oxidized soil areas were not present within the fill. The feature fill was very homogenous in content with the exception of a concentration of deer remains on the southeastern edge of the feature that extended from the surface to a depth of 5 cm below. Feature 42 contained the most diverse faunal assemblage of any of the pit features at the site, with white-tailed deer, raccoon, box turtle, mussel, and bird remains present. Cultural material within the feature consisted of shell-tempered ceramics (n=56) including plate, bowl, and red-slipped everted jar rims; lithic material (n=35) including a stemmed projectile point, an isosceles triangular arrow point, polished flakes, utilized flakes, debitage, and a sandstone abrader; and broken rock including limonite, sandstone, limestone, and igneous/metamorphic cobble fragments. Botanical material recovered from a 10 liter flotation sample consisted of nutshell (0.56 g), wood (0.1 g), and maize (0.01 g).

Feature 44 (Table 19; Figure 24) was located 1.80 m northwest of Structural Complex 1. The feature was first defined when a large quantity of bone was exposed during the mechanical stripping, leading to an initial interpretation of the feature as a human burial. Shovel scraping and troweling of the exposed subsoil revealed that in actuality, feature 44 was a large circular feature with the partially

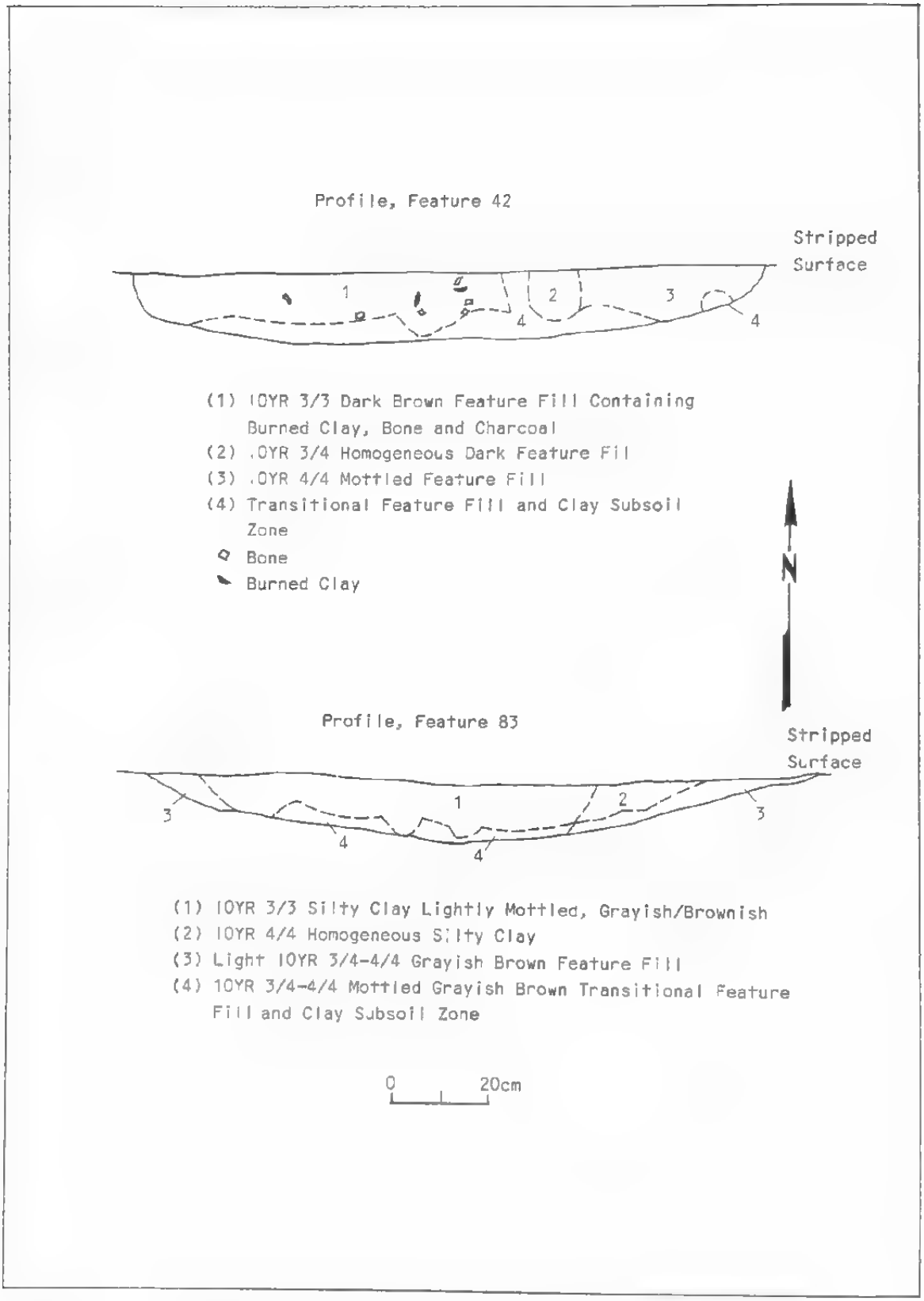


Figure 23. Profiles, large shallow basins, features 42 and 83.

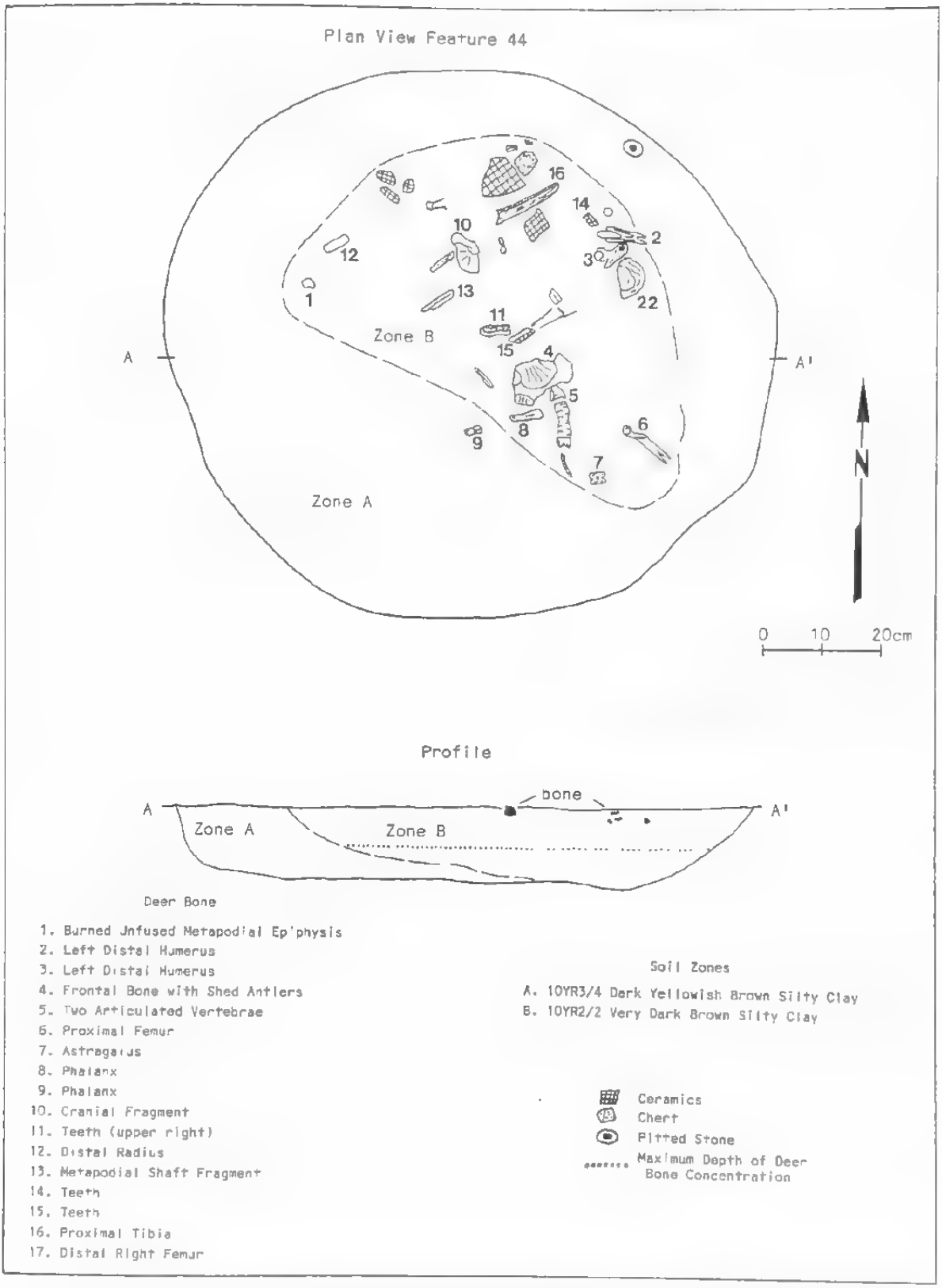


Figure 24. Plan view and profile, feature 44.

articulated remains of at least two deer skeletons exposed on the feature surface. In profile, the feature appeared as a shallow (14 cm) basin containing a 10YR 3/4 dark yellowish brown to 10YR 2/2 dark brown silty clay fill with slight charcoal flecking. The skeletal material was restricted to the northeast half of the feature. The articulated remains consisted of several vertebrae in correct anatomical position in association with a portion of a deer cranium with shed antlers. Surrounding and beneath the partially articulated remains was a large quantity of additional deer remains including another cranium, scapulae, fragmentary long bones, and other skeletal material. Most of the bones comprising this group of skeletal material were in contact with each other, indicating that the material was deposited in a single dumping episode. Based on the partially articulated remains, the deer skeletons must have been discarded shortly after butchering before they completely decomposed. Faunal remains were the predominant prehistoric material (n=1,002) in feature 44, with deer comprising 97% of all identifiable screened remains. Other identifiable remains included striped skunk, raccoon, pocket gopher, and box turtle. Other material within the feature included shell-tempered ceramics (n=15) including two fragments of an incised plate rim, chert debitage (n=2), flake tools (n=4), and a modified cobble tool. The recovery of two fragments of an incised plate provided some evidence that burning may have occurred in the feature. The two fragments join together, the smaller of the two sherds being orange in color while the larger sherd is black with an exfoliated burned surface. Additional parts of the plate were not found. The presence of unburned and burned areas on the same vessel fragment suggests that a single unburned sherd was deposited in the feature, where it subsequently broke, with one section being accidentally refired.

Feature 80 (Table 19) was located approximately 20 cm southeast of Structural Complex 2. The feature was defined in plan view as a 10YR 5/4 dark yellowish brown circular stain with a light scattering of charcoal, burned clay, and burned bone flecks. In profile, the feature appeared as a shallow (13 cm) basin containing a homogenous light brown fill with a slightly higher frequency of charcoal flecking in the western half of the feature. In situ burning was not observed, but the soil around the southern perimeter of the feature had a slightly ashy texture, and a fair amount of burned clay (48 g) was recovered from the feature. A very large slab of limestone weighing 1.08 kg was located in the center of the feature. In terms of the pit features at the site, this is a unique artifact that was not represented in any other feature or in either of the structural complexes. The slab resembles a mortar, but use wear is not evident. The remainder of the cultural material within the feature consists of discarded items including shell-tempered ceramics (n=66); lithic debitage (n=10); five modified cobbles; and a small amount of limestone, sandstone, and igneous/metamorphic rock.

Feature 83 (Table 19) was located 1.20 m north of Structural Complex 2 and was very similar in appearance to feature 80 (Figure 23). The feature fill was a 10YR 3/3 brown silty clay with a light scattering of ash and charcoal along its western edge. In profile, the feature fill was very homogenous with virtually no inclusions, and it may

represent a natural filling of the basin. Artifact density within the feature was very light, consisting of five shell-tempered sherds, three grit-tempered sherds, debitage (n=2), a projectile point tip, sandstone (24 g), and limonite (0.02 g).

Feature 91 (Table 19) was located approximately 1 m south of Structural Complex 1. The feature contained a 10YR 3/4 dark yellowish brown silty clay fill with charcoal, burned bone, and burned clay flecks lightly scattered throughout the fill. A large amount of cultural material was contained within the feature given its relatively shallow (14 cm) depth, including 313 sherds, unifacial and bifacial tools, and faunal material (n=76). Botanical material within the flotation sample included nuthulls, maize, and wood charcoal.

Medium Shallow Basins (n=6)

These are basins with a diameter of from 35 to 75 cm. As a group, they are much smaller than the large shallow basins, with a mean maximum diameter of 53 cm. Most contained no evidence of burning, and their original function is uncertain. One (feature 69) is located within Structural Complex 2. In terms of spatial distribution, all of the small shallow basins except feature 69 are located to the south and west of Structural Complex 1.

Feature 3 was discovered during the controlled excavations in unit N260E180 west of excavation block A (Figure 10). The feature originated at the base of the plow zone and was initially defined as a diffuse stain only slighter darker than the surrounding clay matrix. In profile, the feature was defined as a shallow basin containing a 10YR 3/4 to 3/3 dark brown fill. The feature contained a small amount of cultural material including shell-tempered ceramics, lithic debitage, sandstone, and faunal remains.

Feature 36 (Table 19; Figure 10) was located midway between the two structural complexes. The feature was very ill-defined, containing a charcoal flecked 10YR 5/4 yellowish brown silty clay only slightly darker than the surrounding matrix. A slightly darker circular stain that could represent the base of a post was present at the bottom of the feature. This stain measured aspproximately 10 cm in diameter, extended 5 cm beneath the base of the feature, and had a rounded base. One shell-tempered body sherd was recovered from the feature. The function of this feature is unknown.

Feature 69 was an irregularly shaped basin located within the small rectangular structures (2b-d) associated with the Structural 2 complex overlapping the west wall trench (feature 72) of the earliest structure (2e). The feature fill was a 10YR 3/3 dark brown silty clay containing a large amount of charcoal. In situ burning was not present. In terms of its size, feature 69 contained a relatively large amount of rock including sandstone, limestone, limonite, and a modified cobble (Table 19). The feature also contained the only piece of copper found at the site, a small fragment weighing less than a tenth of a gram. Based on the rock and large amount of charcoal in the fill, feature 69 may

represent a hearth for one of the structures in the complex. If so, it is unike the other two structure hearths (features 27 and 75) which had oxidized bases.

Feature 81 was an oval basin located within the extreme northwestern corner of the large square structure (Structure 2a). There is no evidence to indicate the feature is associated with the structure although it could be. The feature contained a very homogenous 10YR 4/6 dark yellowish brown fill. In contrast to feature 52, the feature contained a diverse artifact assemblage including shell-tempered ceramics, unifacial tools, lithic debitage, a modified cobble tool, and limestone and limonite (Table 19). The function of this feature is unknown.

Features 94 and 95 were excavated under adverse conditions at the end of the project. Both features were extremely baked out, making definition of the feature edges difficult. Feature 94 appeared in profile as a shallow basin containing a 10YR 3/4 dark yellowish fill. Burned clay and bone flecks were present in the feature profile. No material other than rock was recovered from the feature. Feature 95 was located immediately south of feature 94. The feature was basin shaped in profile and contained a 10YR 3/4 yellowish brown charcoal flecked silty clay fill. Function is unknown.

Deep Basins/Pits (n=3)

Only two pit features with a defined depth of greater than 30 cm were found at the site. Two of these (features 57 and 75) are overlapping interior pit features within Structural Complex 2 and are described in the structure section of this chapter. The remaining feature (feature 7) was discovered during the test excavations in unit N260E170. The feature was defined as a relatively deep basin containing a 10YR 3/4 dark yellowish brown feature fill with charcoal flecks scattered lightly throughout the fill. Heavy rodent disturbances were present along the surface and base of the feature. Cultural material within the feature consisted of two shell-tempered sherds and a piece of lithic debitage. The function is unknown.

Other (n=2)

One stain initially interpreted in plan view as a feature (feature 6) was reclassified as a post mold following its excavation and is discussed in the post mold section of this report. Another feature (feature 50) was determined to be natural in origin.

Post Molds

The majority of the post molds (n=95) were located in or adjacent to the structures and were discussed earlier in this report. Four post molds (post molds 1, 2, 56, and 57) were located between and south of the two structural complexes. These were isolated post molds whose original function is uncertain. The post molds ranged in diameter from 10 to 20 cm with a mean of 13.5 cm. Depth ranged from 10 to 25 cm with a

mean depth of 16.5 cm. All were straight sided with round (n=3) or flat (n=1) bottoms. One (post mold 57) is possibly historic based on the looseness of the fill. All four post molds contained charcoal in their fill.

The low frequency of post molds between the two structural complexes may be a result of plowing or the mechanical stripping. Shallower post molds may have been destroyed, while only post molds containing a dark fill would have been recorded during the mechanical stripping. Both of the post molds located during the hand excavation of the site (post molds 1 and 2) contained a very light fill and would not have been easily definable during the mechanical stripping.

One large post mold was originally defined as a feature and was assigned a feature number (feature 6). In reality, the feature appears to be a large straight-sided post with a round bottom (Table 19). The feature fill was a mottled yellowish brown 10YR 3/4 clay with charcoal flecks scattered throughout. Two fragments of igneous/metamorphic rock were recovered from the feature.

Discussion

Forty external pit features were excavated at the site (Figure 10). Thirty seven of these features were distributed between and south of the structural complexes, while two (burial 1 and feature 53) were located at the north end of the site. In addition, six pit features were located within Structural Complex 2.

The contemporaneity of pit features at an archaeological site can be determined on the basis of ceramic fits between features. If sherds from the same vessel are contained in two or more pit features, it can be assumed that these features were filled at approximately the same time. All of the Bonnie Creek site ceramics from a pit feature and structure context were examined, but no matches were identified. This is partly a reflection of the shallowness of the features (none had a defined depth greater than 35 cm) and the consequent small amount of material contained within the features and partially a reflection of the fact that the majority of the features were smudge pits that contained botanical material and little else. Feature 42 contained a single cordmarked sherd very similar in color and thickness to the cordmarked sherds from feature 80, but this sherd could not be fitted to the feature 80 vessel.

Because none of the pit features could be demonstrated to be contemporary with each other or with the structural complexes, pit feature distribution at the site was examined on the basis of two arbitrary assumptions. The first assumption was that feature distribution at the site is patterned and nonrandom, with the features occurring in clusters that mark the location of prehistoric activity areas. Five such clusters (A-E) were identified (Figure 25). It was further assumed that a feature cluster located adjacent to a structural complex was associated with that structure. That both of these assumptions may be incorrect is acknowledged. However, in the absence of

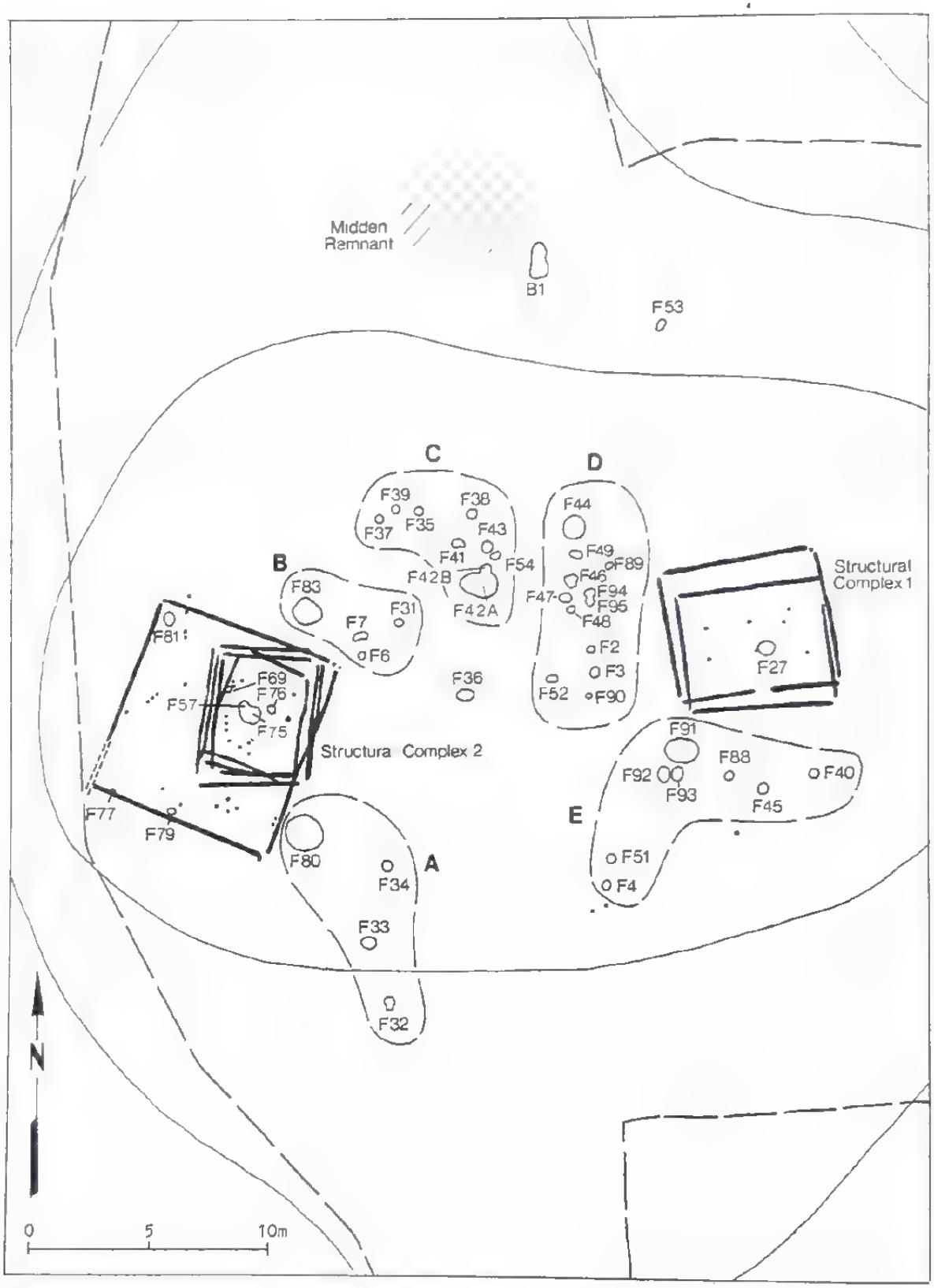


Figure 25. Assumed pit feature clusters, Bonnie Creek site.

specific data linking the pit features with each other or with the structural complexes, these assumptions provide a starting point from which site community patterns can be examined.

A circle with an arbitrary radius of 11 m was drawn from the center of each of the two structural complexes to determine which features were closest to which structural complex (Figure 26). Eleven meters was chosen as the radius as this was the largest whole number that could be used without the circles overlapping. In terms of Structural Complex 1, all of the features in clusters A and B are contained within the radius with the exception of feature 32. This feature is still closer to Structural Complex 2 (8 m) than it is to Structural Complex 1 (15 m). In addition, feature 32 in the site center is contained within the radius. In terms of Structural Complex 1, all of the features within clusters D and E were contained within the radius with the exception of feature 4. Feature 4 is closer (8 m) to Structural Complex 1 than it is to Structural Complex 2 (11.60 m), however. The feature cluster in the site center (cluster C) is located almost equidistant between the two structural complexes, and its association is unclear.

Assuming the feature clusters represent cultural reality, differences are evident between the types and number of features associated with the two structural complexes. Clusters A and B contain eight features, while clusters D and E contain 20; clusters A and B contain storage pits (n=2), smudge pits and possible smudge pits (n=4), a large post, and a deep basin while Clusters D and E contain storage pits (n=2), smudge pits and possible smudge pits (n=11), possible cooking pits (n=3), shallow basins (n=3), and a possible post (Figure 27). The major difference between the clusters is the presence of three features near Structural Complex 1 (features 47, 48, and 93) which contained very dark fill with large pieces of charcoal and burned clay. In addition, feature 44 contained an incised plate fragment consisting of two sherds, one of which had been refired to a bright orange red, a possible indication of burning in that feature. Even if the soil within these features was burned elsewhere and redeposited in these features, no features in the clusters associated with Structural Complex 2 contained any evidence of burning. The implication is that cooking activities at the site, regardless of whether they were actually occurring within the cluster D and E features, were occurring near Structural Complex 1 as opposed to Structural Complex 2.

Both structural complexes are similar in that large basins interpreted as the remains of storage facilities (features 44, 80, 83, and 91) were located in the adjacent clusters. Feature 44 contained a partially articulated deer carcass with shed antlers. The deer must have been discarded and covered up in the feature shortly after death before dogs or other scavengers could completely disarticulate the skeleton. This indicates that the feature was open and available for refuse disposal between early January and late March, the period during which deer shed their antlers (Hawkins et al. 1968). If feature 44 was originally a food storage pit, late winter would have been a logical time for the feature to have been opened and its contents removed. If feature 44 is associated with Structural Complex 1 (as it appears to

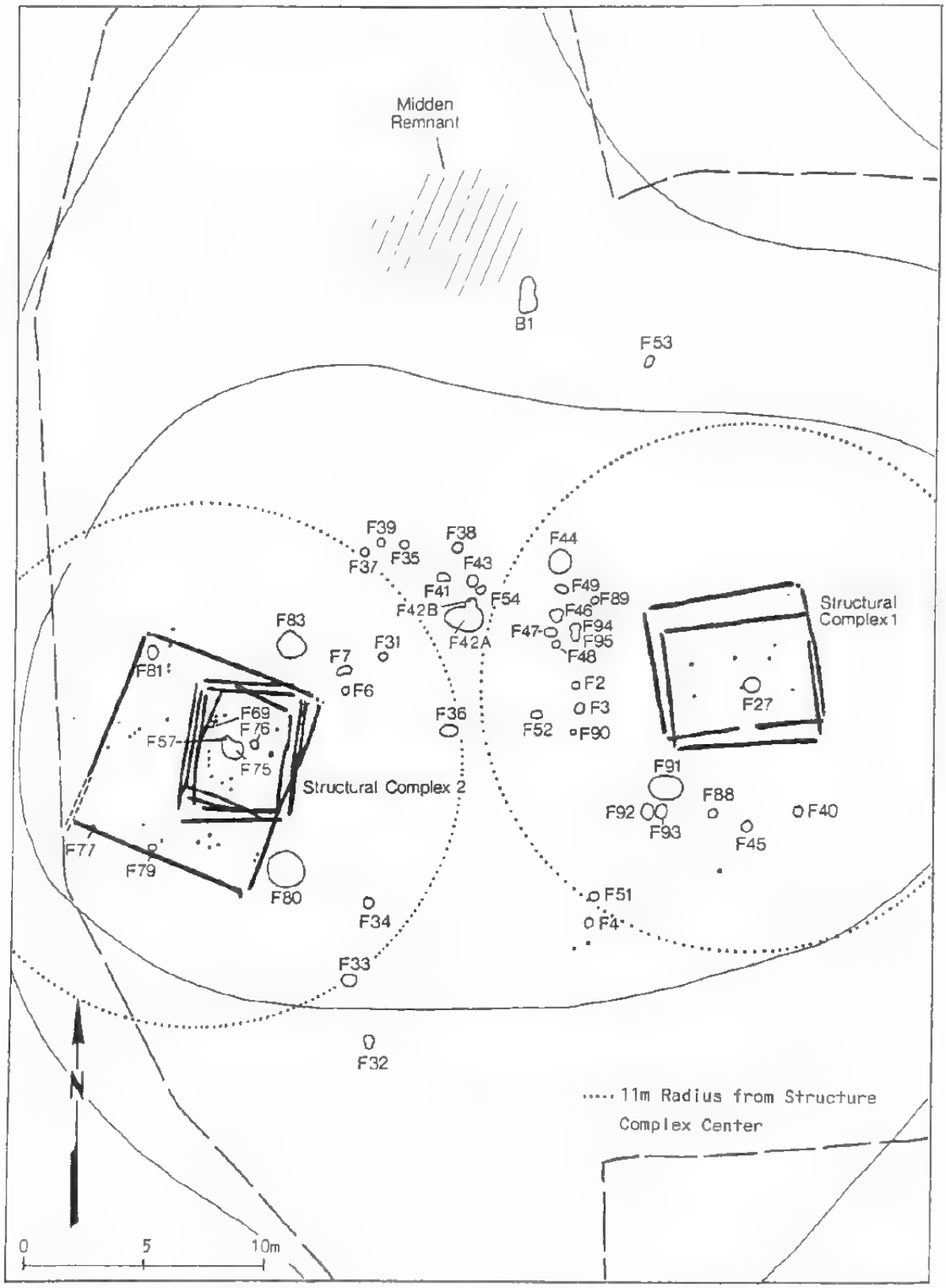


Figure 26. Pit feature distribution within 11 m radii of Structural Complexes 1 and 2, Bonnie Creek site.

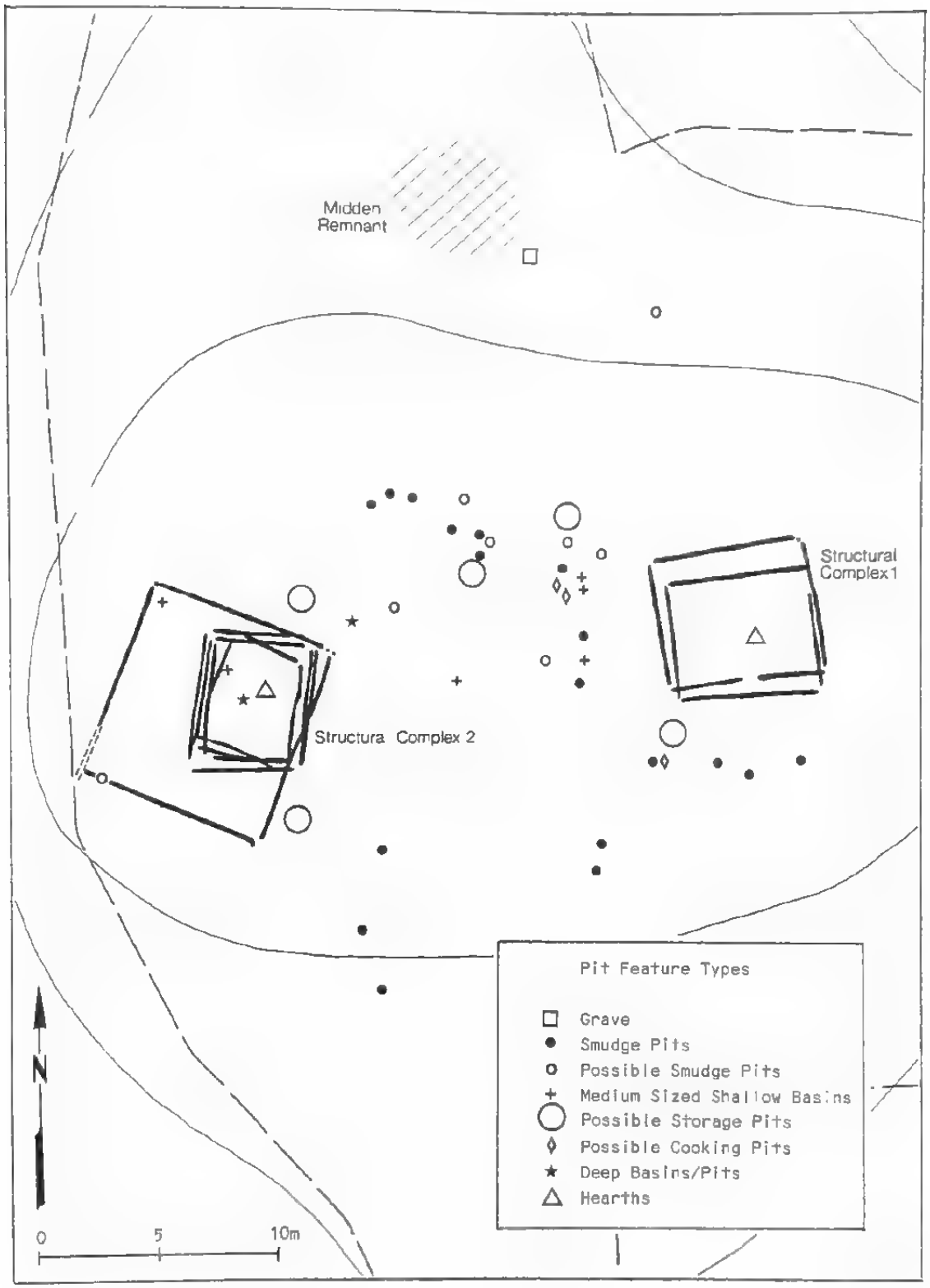


Figure 27. Pit feature types, Bonnie Creek site.

be), the winter killed deer within the feature supports the interpretation of Structures 1 and 1b as cold weather structures. The presence of two large storage pits (features 80 and 83) in clusters A and B does not negate the interpretation of the large structure (2a) as a summer house as these features may be associated with the small structures (2b-e).

Bloom's (this volume) faunal analysis revealed that faunal material was unevenly distributed among the five feature clusters. Faunal material was recovered from within both structural complexes and from the features in clusters A, B, and C, but no faunal material was recovered from the cluster D and E features. Preservation does not appear to be a factor as a small amount of faunal material was recovered from features 57/75 and 76 within Structural Complex 2 west of the feature clusters. Similarly, faunal remains were recovered from four of the nine features in cluster C located immmediately northeast of cluster B. If preservation is not a factor, the faunal data indicate that faunal remains were discarded in the feature clusters adjacent to Structural Complex 1 at the northern end of the site, at the southern end of the site, and in cluster C. The inference is that animals were being butchered, cooked, eaten, and the remains discarded in these areas and that this activity was not occurring in the area of clusters A and B. This agrees with the interpretation of the fill in three features in clusters D and E as being associated with cooking and the absence of this activity in clusters A and B. The overall impression is that a wider variey of activities occurred in the area of Structural Complex 1 than in the area of Structural Complex 2. This possible variance in site activities provides only equivocal support for the interpretation of the large structure as a summer house. The residents of the site would have needed to cook and eat during the summer the same as in winter, and evidence of this activity should be present if Structure 2a is a summer house. The only animal species represented at the Bonnie Creek site that had to have been procured during the warm weather months are turtles, which are available only from April to October or November. Other species which probably were taken during the warmer months but which could have been procured on a year-round basis include fish and mussels. However, these remains were not contained within the cluster A and B features but were present in features 38, 42a, 42b, 44, 53, 91 in clusters C, D, and E and in the burial 1 grave fill at the north end of the site. The distribution of warm weather species conforms to the overall distribution of faunal remains at the site. The inference is that the area around Structural Complex 1 functioned as a food processing area on a year-round basis and that this activity did not shift to the Structural Complex 2 area during the warmer months. Another possible inference is that Structure 2a does indeed represent a special use structure (i.e., a public or ritual building) and that everyday activities were concentrated away from this structure. If Structure 2a was a ritual building, no evidence of this activity was found, with material from within the structure and the adjacent pit features consisting of everyday items.

As discussed earlier, one possible interpretation of the site community patterns is that Structural Complex 1 and Structure 2a of

Structural Complex 2 were contemporary. The large size of Structure 2a and the lack of a structure depression suggest that it may have been a warm weather structure or summer house. Structures 2b-e represent a later Mississippian occupation in which a small structure was excavated in the former location of Structure 2a. The small size and internal hearth of Structures 2b-e suggest that it could have been a cold weather structure. If this is correct, the inhabitants of Structures 2b-e would have needed storage facilities similar to those associated with Structural Complex 1. In this case, features in clusters A and B may be associated with Structures 2b-e rather than with Structure 2a. The association of cluster C is unclear. This feature cluster is intermediately located between the two complexes and may be associated with either one. The association of the midden area and the burial are also unclear. If the two occupations are close enough in time (as the ceramics indicate they are), these features could have been utilized during both occupations.

In sum, the feature distribution at the site was formed by two noncontemporaneous Mississippian occupations. During the earlier occupation, two structures appear to have been located at opposite ends of the site. Storage and cooking facilities were concentrated around the possible cold weather structure (Structural Complex 1) at the eastern edge of the site. Storage and smudge pits are also located near Structural Complex 2, but these may be associated with the later occupation. A single feature (feature 36) that may have marked the site center was located between the two structures. Subsequent to this occupation, a structure with an internal hearth (2b-e) was constructed through Structure 2a. Feature clusters A and B may represent storage and hideworking facillities for this structure. Feature cluster C may be associated with this occupation, but this is uncertain. The midden area and possibly the grave may have been utilized during both occupations.

CHAPTER IV. CERAMICS

Mark J. Wagner

Introduction

A total of 1,216 ceramic artifacts was recovered from the excavation units, pit features, structures, post molds, and surface of the site (Table 21). All of this material consisted of sherds or partial vessels with the exception of a pottery trowel from Structural Complex 1 and a miniature jar recovered after the mechanical stripping. Shell and grog tempered Mississippian ceramics comprised the majority of the assemblage (n=1149; 95.5%), with two partial vessels--a large jar and a shallow bowl or pan--recovered from feature 75 in Structural Complex 2. Middle Woodland Crab Orchard (n=19) and Late Woodland (n=44) ceramics were recovered from the plow zone and in association with Mississippian ceramics in the pit features and structure depressions. Crab Orchard or Late Woodland features were not present at the site. Crab Orchard ceramics were recovered in minor quantities at all of the Late Woodland and Mississippian sites in the project area, and their presence at the Bonnie Creek site is not surprising. The Late Woodland ceramics are small and badly eroded, and they may be associated with activities connected with the very large circular Late Woodland community (the Jamestown site) which lies approximately 200 m south of the Bonnie Creek site.

The objectives of the ceramic analysis were: the complete description of the Mississippian ceramic assemblage; a comparison of the assemblage with that from other Mississippian occupations in the project area; and comparisons with ceramic assemblages from the American Bottom, Kaskaskia, and Big Muddy River drainages. One hundred percent of the ceramic assemblage was identified as to surface treatment and temper. Temper was identified macroscopically. All of the intact Crab Orchard and Late Woodland sherds were measured for wall thickness, while a nonrandomly drawn sample of the Mississippian ceramics (all rim sections and body sherds over 25 mm in diameter from a pit feature context) were measured. The lip orientation and rim height of all Mississippian ceramics were measured in accordance with criteria defined by Milner and Williams (1984).

Table 21. Ceramic Data.

	Body Sherds						Rims						
	Shell Tempered			Grit Tempered			----------Shell Tempered----------						
	*P	CM	I	P	CM	I	Jars	Bowl/Pan	Plate/Dish	MV	U	Total	Percent
Structural Complex 1	130	2	44	14	1	6	-	-	-	-	-	197	16.2
Structural Complex 2	209	31	79	26	2	-	5	6	-	-	4	362	29.8
Pit Features	261	37	70	5	-	-	10	4	1	-	2	390	32.0
Units	216	-	9	2	-	7	3	-	3	1	10	251	20.7
Stripping	1	-	-	-	-	-	2	1	2	1	8	15	1.2
Total	817	70	202	47	3	13	20	11	6	2	24	1215	
Percent	67.2	5.8	16.6	3.9	0.2	1.0	1.6	0.9	0.5	0.2	2.0		

* P = Plain
CM = Cordmarked
I = Indeterminate
MV = Miniature Vessel
U = Unknown

Type 1: Crab Orchard

Crab Orchard ceramics occur in Early to Middle Woodland contexts in southern Illinois (Hargrave 1982:1235-1238; Maxwell 1951; McNerney 1975; Woods and Denny 1980). This ceramic type can be distinguished from grit/grog-tempered Late Woodland ceramics on the basis of the much larger temper size, thicker vessel walls, an orange to buff exterior surface color, and fabric impressions on some sherds. Temper size is large and includes crushed rock, chert, and sherds. Three surface treatments are recognized: plain, cordmarked, and fabric impressed. Both fabric-impressed and cordmarked ceramics have been recovered from other sites in Burning Star Mine #4. Stephens (1975:267) noted that plain surfaced Crab Orchard ceramics are actually cordmarked or fabric-impressed sherds on which the original surface treatment has been obliterated by smoothing. The Crab Orchard ceramics from the Bonnie Creek site consisted of cordmarked (n=12), plain (n=4), and residual (n=3).

Crab Orchard ceramics were recovered in small quantities from four other sites with Late Woodland and Mississippian occupations (21C4-9, -14, -34, -35) located north of the confluence of Bonnie, Galum, and Rock Fork creeks; from site 21C4-27, a predominantly Late Archaic/Early Woodland site south of the confluence of the three creeks; and from site 21C4-132, an Archaic through Woodland nut collecting/hunting camp located in the upper reaches of Bonnie Creek. Crab Orchard occupations at these sites are very light, with a single Crab Orchard basin identified at site 21C4-35. The light scattering of Crab Orchard ceramics at the Bonnie Creek site is consistent with the pattern observed throughout the study area.

Type 1a: Crab Orchard, Grit/Grog Tempered, Plain (n=4)

Plain Crab Orchard ceramics were recovered from the plow zone (n=1), Structural Complex 2 (n=1), and a Mississippian pit feature (n=2). Sherd thickness ranged from 7.9 to 10.10 mm with a mean thickness of 9.51 mm. The exterior surface color varied from orange to orangish brown while the interior surface color ranged from orange to brown or black. Three of the sherds were densely tempered with a combination of grog, limestone, igneous/metamorphic rock, and quartzitic pebbles. The fourth sherd was lightly tempered with a combination of rock and grog. The temper was coarse, but exact temper size was not determined. The mean thickness (9.51 mm) of the plain sherds is larger than that of the cordmarked sherds (6.98 mm). This thickness difference suggests that the plain sherds may be from the lower body section of the vessel.

Type 1b: Crab Orchard, Grit/Grog Tempered Cordmarked (n=12)

All of the cordmarked sherds are probably part of a single vessel as they were recovered in a single cluster in Structural Complex 2. The cordmarking on these sherds is smoothed over and indistinct. Exterior surface color varied from orange to brown while the interiors ranged

from orange to black. These sherds were much finer tempered than the plain sherds with the temper consisting of grog and rock.

Type 1d: Residual (n=3)

This type consists of sherds that are too small or eroded to confidently identify the surface treatment.

Type 2: Late Woodland

Forty four thin grit/grog-tempered sherds were recovered from the structures, features, and excavation units at the site (Table 21). Similar to the Crab Orchard ceramics, this assemblage consisted of small, isolated sherds. All are body sherds with the exception of one very thin rim sherd. The classification of this material as Late Woodland was based on temper, sherd thickness, and color.

Late Woodland ceramics in the upper Galum Creek drainage are synonomous with the Late Woodland Raymond and Dillinger ceramic types of southern Illinois. Straight-sided cordmarked bowls, constricted neck jars, and miniature vessels comprise the earlier part of the Late Woodland ceramic assemblage in the upper Galum Creek valley. Decoration consists of notches and nodes, with notches gradually replacing nodes at ca. A.D. 700 (Holley n.d.:4). Dillinger ceramics consisting of large, thick cordmarked jars with folded rims are associated with terminal Late Woodland (A.D. 900-1000) occupations.

Based on wall thickness, the thin grit/grog-tempered ceramics at the Bonnie Creek site are associated with the earlier part of the Late Woodland occupation. Unlike the Crab Orchard occupations, Late Woodland occupations in the upper Galum Creek valley are intensive and characterized by numerous pit features, structures, and--in the case of the Jamestown site--an organized community plan. The Jamestown site, the largest Late Woodland community in the project area, is located approximately 200 m south of the Bonnie Creek site. The lack of Late Woodland features at the Bonnie Creek site suggests that the Late Woodland ceramics at the site may be associated with activities connected with the nearby Jamestown site (Figure 6).

Type 2a: Late Woodland, Grit/Grog Tempered, Cordmarked (n=6)

Cordmarked sherds were recovered from a wall trench (feature 63) associated with Structural Complex 2 (n=3), from within the structural complex (n=2), and from Structural Complex 1 (n=1). Five are body sherds, while one is a rim. The very small rim has a cordmarked exterior surface with vertical cord impressions extending to the vessel lip. The rim is undecorated and has a narrow, pinched lip. The temper consisted of crushed igneous/metamorphic rock. The five body sherds nad buff exterior surfaces with interior surface colors that ranged from brown to orange to black. All of the body sherds were tempered with finely crushed igneous/metamorphic rock and grog; tne three sherds from

feature 63 had a coarse, grainy texture. The six sherds ranged in thickness from 5.3 mm to 5.6 mm with a mean thickness of 5.46 mm.

Type 2e: Residual (n=38)

These are small eroded sherds on which the original surface treatment could not be determined.

Type 3: Mississippian Ceramics

A total of 1,152 Mississippian sherds, including rims and body sherds, was recovered from the Bonnie Creek site (Table 21). Macroscopic examination of the sherd temper revealed that shell was the primary tempering agent with a small amount of grog mixed in. Limestone tempering, a characteristic of earlier Mississippian ceramic assemblages in the American Bottom, was not identified. Fifty seven rims representing at least 36 separate vessels were recovered. A restricted range of vessel forms consisting of large jars, small jars, plates/dishes, and bowls/pans was present. The small size of the majority of the vessel rims made it impossible in most cases to distinguish between vessel forms such as bowls and pans. Smoothed plain was the predominant surface treatment, comprising 92.7% (n=877) of all identifiable sherds and 92.1% of all body sherds. Small jars, bowls/pans, and plates/dishes had smoothed plain surfaces. Cordmarking was identified on one jar shoulder and on large body sherds that appeared to be jar fragments. Fabric marking was completely absent.

Observations including surface treatment, color, temper, and thickness were made on a sample of 71 body sherds from a pit feature context (Table 22). Sherd thickness varied from 3.0 to 12.0 mm with a mean of 4.7 mm. Orange was the predominant exterior surface color (n=41; 57.7%) followed by buff (n=17; 23.9%), brown (n=10; 14.0%), and black (n=3; 4.3%). Shell was the predominant temper, with small amounts of grog present in 14 sherds. Because of the thinness of the majority of the sherds, core colors were often simply part of a gradation between the exterior and interior vessel surface colors (Table 22). As with the Mississippian ceramic assemblage as a whole, smoothed/plain was the dominant surface treatment, occurring on 69.0% of the sample body sherds.

Jars

Excluding the unidentifiable rims, jars were the predominant vessel type, comprising 55.9% of all vessel shapes. Two jar sizes, large (Figure 28a-f) and small (Figure 28l-q), were defined on the basis of wall thickness, lip length, and rim height (Table 23). The rim height and lip length of the jars were measured in accordance with the procedures presented in Milner (1984:163-170) and Morgan (1985:23, 46-47). Rim height and lip length increase throughout the Mississippian period and can be reliable indicators of the relative temporal placement of a particular ceramic assemblage (Fowler and Hall 1972; Vogel 1975). However, in determining the lip length of the vessels in the Julien

Table 22. Body Sherd Data*, Mississippian Ceramics, Pit Features.

Feature	Surface Treatment		Exterior Color				Temper	Core Color	Thickness (mm)		
	Cordmarked	Plain	Brown	Buff	Black	Orange			Min.	Max.	Mean
42a		x		x			Shell	Orange	5.5	5.7	5.60
42a		x			x		Shell	Orange/Gray	6.8	5.9	5.85
42a		x				x	Shell	Orange/Gray	6.0	7.3	6.65
42a		x				x	Shell	Orange/Gray	6.8	7.4	7.20
42a	x					x	Grog	Orange/Black	7.5	7.5	7.50
42a	x			x			Shell/ Grog	Buff/Black	4.9	4.9	4.90
42a						x	Shell	Orange/Brown	3.7	3.3	3.50
42b				x			Shell/ Grog	Buff/Black	5.5	5.5	5.50
44		x		x			Shell	Black	6.0	7.7	6.85
44		x		x			Shell	Black	4.1	5.0	4.55
44		x		x			Shell	Black	4.0	4.5	4.25
44		x		x			Shell	Black	4.1	5.5	4.80
44		x		x			Shell	Orange/Black	5.6	6.4	6.00
44		x		x			Shell	Brown/Black	5.0	5.5	5.25
44		x		x			Shell	Black	3.9	4.4	4.15
44		x				x	Shell	Orange/Black	3.0	3.3	3.15
44		x				x	Shell	Orange/Brown	5.0	5.0	5.00
44		x			x		Shell	Black	3.3	4.3	3.80
44		x			x		Shell	Black	4.1	4.4	4.25
54		x				x	Shell	Orange/Black	5.5	6.0	5.75
57		x				x	Shell	Orange/Buff	4.8	5.1	4.50
57/75**		x		x		x	Shell	Orange/Black	5.4	5.4	5.40
80	x					x	Shell	Orange	4.2	4.2	4.20
80	x		x				Shell/ Grog	Black	3.4	3.4	3.40
80	x		x				Shell/ Grog	Brown	3.6	4.3	3.95

*Only sherds with an approximate 25 mm diameter are included in this table.

**Feature 57/75 contained 25 sherds over 25 mm in diameter, all from the same section of a single vessel. Observations were made on only one of the sherds.

Table 22. (cont'd).

Feature	Surface Treatment		------Exterior Color------				Temper	Core Color	--Thickness (mm)--		
	Cordmarked	Plain	Brown	Buff	Black	Orange			Min.	Max.	Mean
80	x					x	Shell	Orange	4.7	5.0	4.85
80		x				x	Shell	Orange	5.5	7.5	6.50
80		x				x	Shell/ Grog	Brown	3.8	3.8	3.80
80	x					x	Shell	Orange	3.8	3.8	3.80
80	x					x	Shell/ Grog	Orange	4.1	5.0	4.55
80		x				x	Shell/ Grog	Orange	3.0	4.5	3.75
80	x					x	Shell	Orange	3.9	4.6	4.25
80		x				x	Shell/ Grog	Orange	3.5	4.6	4.05
80	x					x	Shell	Orange	3.2	4.3	3.75
80	x					x	Shell/ Grog	Orange	4.0	4.4	4.20
80	x					x	Shell	Orange	4.6	5.5	4.55
80		x	x				Shell	Brown	4.0	4.5	4.25
80	x		x				Shell/ Grog	Brown	4.0	4.4	4.20
80	x		x				Shell/ Grog	Brown	3.7	4.0	3.85
80	x					x	Shell	Orange	3.8	4.0	3.90
80	x		x				Shell	Brown	3.1	3.3	3.20
80	x		x				Shell	Brown/Orange	4.0	4.4	4.20
80		x	x				Shell	Brown	5.6	5.6	5.60
80	x					x	Shell/ Grog	Orange	5.3	5.5	5.40
80		x				x	Shell	Orange	4.3	4.5	4.40
80	x		x				Shell	Black	2.7	3.2	2.95
80		x				x	Shell	Orange	3.3	3.3	3.30
80		x				x	Shell	Black	3.3	3.6	3.45
83		x		x			Shell/ Grog	Buff/Black	5.5	5.5	5.50
91		x				x	Shell	Orange/Gray	10.5	10.5	10.50
91		x				x	Shell	Gray	3.3	5.0	4.15

Table 22. (cont'd).

Feature	Surface Treatment Cordmarked	Plain	Exterior Color Brown	Buff	Black	Orange	Temper	Core Color	Thickness (mm) Min.	Max.	Mean
91		x				x	Shell	Gray	5.2	5.6	5.40
91		x		x			?	Buff/Black	12.0	12.0	12.00
91		x				x	Shell	Orange/Black	5.0	5.0	5.00
91		x				x	Shell	Orange/Gray	3.5	4.0	3.75
91		x				x	Shell	Orange/Brown	6.0	7.5	6.75
91		x				x	Shell	Orange/Brown	3.6	4.0	3.80
91		x				x	Shell	Orange/Black	6.4	6.6	6.50
91		x				x	Shell	Orange/Black	6.6	7.0	6.80
91		x	x				Shell	Black	5.5	7.7	6.60
91		x		x			Shell	Black	6.3	7.0	6.65
91	x			x			Shell	Black	4.7	5.8	5.25
91		x				x	Shell	Buff	4.2	4.3	4.25
91		x				x	Shell	Buff	6.3	6.5	4.25
91		x		x			Shell	Buff	4.1	4.1	4.10
91	x			x			Shell	Gray	5.7	5.7	5.70
91		x				x	Shell	Orange	3.6	4.8	4.20
91	x					x	Shell	Black	5.8	7.5	6.65
93		x				x	Shell/ Grog	Orange/Gray	7.0	7.2	7.10
93		x				x	Shell	Orange/Gray	5.3	6.4	5.85

Figure 28. Ceramic Rim Profiles

a. Large jar, feature 75, Structural Complex 2
b. Large jar, feature 80
c. Jar, Structural Complex 2
d. Jar, red slipped interior, Structural Complex 2
e. Jar, red slipped interior, Structural Complex 2
f. Jar, red slipped interior, feature 42
g. Jar, unit 46
h. Jar, feature 91
i. Small jar, Structural Complex 2
j. Small jar, unit 42
k. Small jar, feature 80
l. Small jar, surface
m. Jar, feature 91
n. Small jar, feature 91
o. Jar shoulder, feature 42a
p. Cordmarked jar shoulder, feature 91
q. Small jar with handle, Structural Complex 2
r. Bowl/pan, mechanical stripping
s. Shallow bowl/pan, Structural Complex 2
t. Shallow bowl/pan, feature 75
u. Bowl, feature 83
v. Incised plate, feature 44
w. Plate, mechanical stripping
x. Plate, mechanical stripping
y. Plate, unit 42
z. Plate, unit 42

aa. Plate, unit 42
bb. Miniature vessel, mechanical stripping

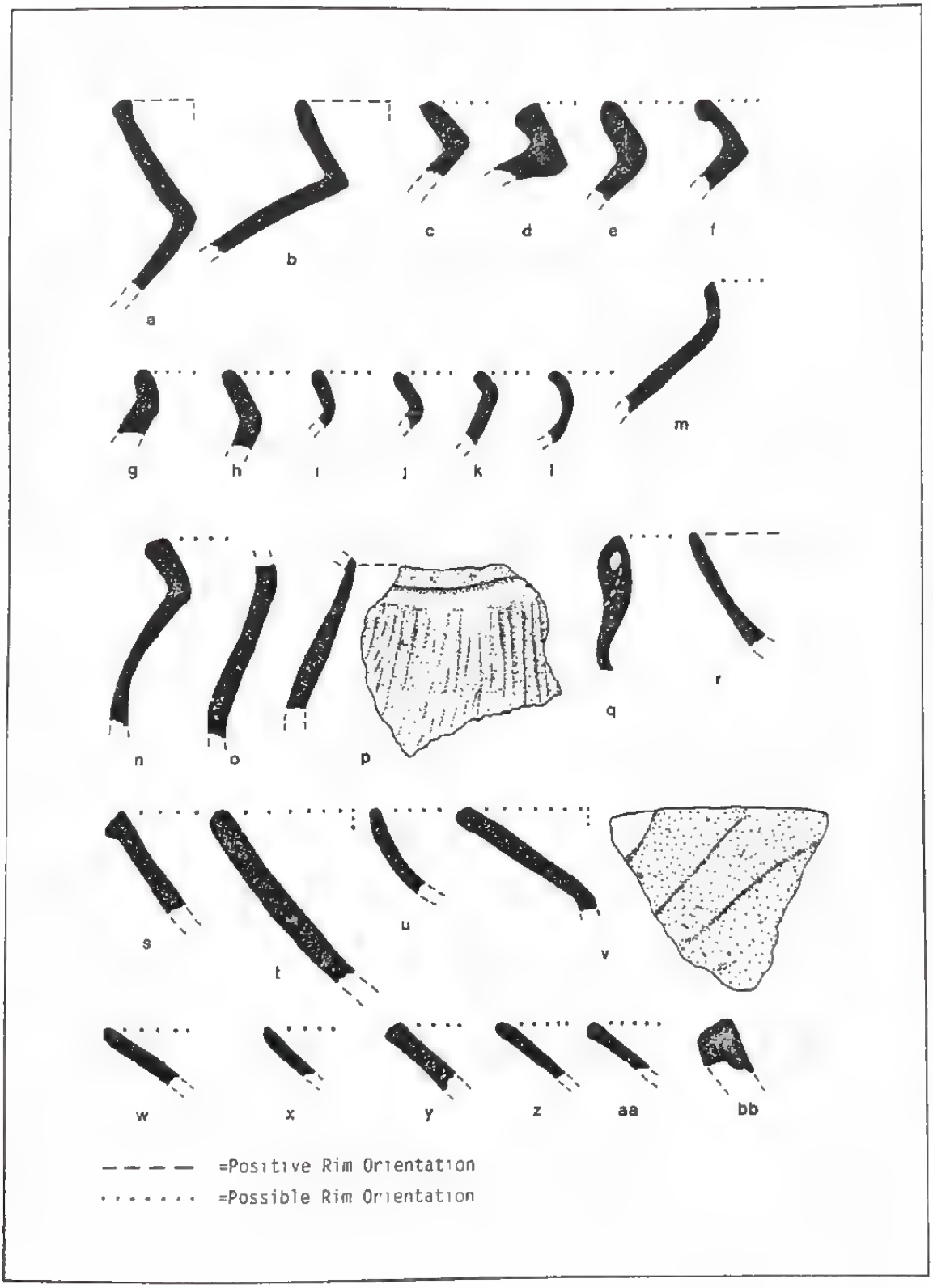


Figure 28. Ceramic rim profiles.

Table 23. Jar, Plate/Dish, and Bowl/Pan Observations.

Jar Observations

Provenience	Unadjusted Lip Length (mm)	Rim Ht. (mm)	Neck/Body Thickness (mm)	Body ---Thickness---- Max. (mm)	Min. (mm)	Mean (mm)	Percent of Rim Present	Minimum Orifice Diameter (cm)	Minimum Neck Diameter (cm)	Shoulder Type	---Color--- Ext.	Int.	Other
Feat. 42a	24.5	12.0	10.0	5.3	5.5	5.4	< 5	Unknown	Unknown	Unknown	Gray/ black	Buff	Red slipped interior
Feat. 42a	-	-	5.5	6.7	6.7	6.7	< 5	Unknown	Unknown	Rounded	Brown/ black	Buff	Reddish brown/black slip
Feat. 75	45.5	37.6/44.9	9.2	4.7	5.2	5.0	70	30	27	Rounded	Brown	Brown	
Feat. 80	34.9	23.3	13.4	9.7	10.1	9.9	8	28-30	21	Unknown	Buff/ gray	Buff/ gray	
Feat. 80	9.3	5.3	6.7										
Feat. 91	-	-	6.7	7.3	7.3	7.3	< 5	Unknown	Unknown	Unknown	Brown	Brown	
Feat. 91	-	11.1	7.1	6.8	7.6	7.2	< 5	Unknown	Unknown	Unknown	Buff	Buff	
Feat. 91	21.0	14.7	7.4	6.6	7.5	7.6	< 5	Unknown	Unknown	Unknown	Buff	Buff	
Feat. 91	20.3	17.4	8.7	4.3	5.0	4.65	< 5	Unknown	Unknown	Unknown	Buff	Gray	
Feat. 91	-	-	-	5.5	8.3	6.9	0	Unknown	Unknown	Rounded	Black	Black	Cordmarked
St. Comp. 2	24.4	12.1	15.5	4.1	4.9	4.5	< 5	Unknown	Unknown	Unknown	Gray	Buff	Red slipped interior
St. Comp. 2	23.7	14.5	9.8	7.9	8.1	8.0	< 5	Unknown	Unknown	Unknown	Buff	Buff	Lip tab
St. Comp. 2	21.1	16.7	10.3	5.7	5.7	5.7	< 5	Unknown	Unknown	Unknown	Buff	Black	Red slipped interior
St. Comp. 2	-	10.0	7.3	4.4	4.4	4.4	< 5	Unknown	Unknown	Rounded	Buff	Buff	Small handle
St. Comp. 2	-	14.2	-	-	-	-	< 5	Unknown	Unknown	Unknown	Buff	Buff	
Unit 42	5.4	10.0	8.5	4.9	6.3	5.5	< 5	Unknown	Unknown	Unknown	Buff	Buff	
Unit 42	12.6	10.3	5.7	-	-	-	< 5	Unknown	Unknown	Unknown	Buff	Buff	
Unit 46	-	12.6	-	-	-	-	< 5	Unknown	Unknown	Unknown	Orange	Buff	
Stripping	22.2	14.4	4.5	4.0	4.0	4.0	< 5	Unknown	Unknown	Unknown	Buff/ gray	Buff/ gray	
Stripping	22.2	13.3	4.4	4.6	4.6	4.6	< 5	Unknown	Unknown	Unknown	Gray	Gray	
Stripping*	1.2	0.7	5.2	0.6	0.6	0.6	100	4.2	2.5	Rounded	Buff	Buff	

* Complete miniature jar

Plate/Dish Observations

Provenience	Lip Shape (mm)	Rim Height (mm)	- Thickness---- Max. (mm)	Min. (mm)	Mean (mm)	Percent of Rim Present	Minimum Orifice Diameter (cm)	Surface Treatment	-----Color----- Ext.	Int.	Other
Feat. 44	Flat	43	6.5	7.3	7.4	8	36	Black filmed, polished	Black	Black	Incised decoration
Unit 42	Flat	Unknown	5.0	6.2	5.6	< 5	Unknown	Red slipped	Red	Black	
Unit 42	Rounded	Unknown	4.8	5.2	5.0	< 5	Unknown	Polished	Black	Black	
Unit 42	Flat	Unknown	4.1	4.9	4.5	< 5	Unknown	Polished	Buff	Buff	
Stripping	Rounded	Unknown	6.3	8.0	7.2	< 5	Unknown	Red slipped, polished	Black	Black	
Stripping	Rounded	Unknown	6.3	6.7	6.5	< 5	Unknown	Polished	Buff	Buff	
Stripping	-	Unknown	5.0	5.2	5.1	< 5	Unknown		Gray	Gray	Incised decoration

Table 23. (cont'd).

Bowl/Pan Observations

Provenience	Lip Shape (mm)	Lip Treatment	Rim Thickness Max. (mm)	Rim Thickness Min. (mm)	Rim Thickness Mean (mm)	Percent of Rim Present	Minimum Orifice Diameter (cm)	Surface Treatment	Color Ext.	Color Int.	Other
Feat. 42	Flat	Folded	6.2	7.6	6.9	< 5	36	Polished	Buff	Black	
Feat. 75	Flat	Thickened	6.0	8.0	7.0	10	44	Plain	Buff	Black	Pan
Feat. 83	-	-	-	-	-	-	-	Smudged	Black	Black	Body section
St. Comp. 2	Rounded	Pinched	5.5	8.3	6.9	6	-	Plain	Orange/ brown	Buff	Bowl (?)
St. Comp. 2	Flat	Folded	6.2	6.6	6.4	-	-	Plain	Gray	Gray	Pan (?)
Stripping	Rounded	Thickened/ pinched	3.2	5.4	4.4	11	22	Smudged	Black	Gray	Bowl
Miniature Vessel Observations											
Stripping	Rounded	-	13.0	-	-	< 5	Unknown	Plain	Gray	Buff	Bowl (?)

ceramic assemblage. Milner (1984:168) only used rim segments comprising at least 5% of the vessel orifice circumference as it is difficult to orient or measure smaller sherds. In the case of the Bonnie Creek site ceramics, only two jars (Figure 28a-b) had rim segments greater than 5%. Over 70% of the feature 75 jar rim was present, with the jar having an orifice diameter of 30 cm and a neck diameter of 27 cm. Approximately 12% of the feature 80 jar rim (Figure 28b) was present, with the jar having an orifice diameter of 24 cm and a neck diameter of 21 cm. Lip length and rim height measurements were taken on the remainder of the Bonnie Creek jar rim segments, and these are presented in Table 23. These data should be viewed with caution because of the small size of the rim sherds.

The lip lengths (unadjusted) of the five large jars ranged from 21.1 mm to 45.9 mm with a mean of 34.82 mm. Milner (1984:168) has developed a formula ([lip length/neck diameter] x 100) for deriving standardized lip length measurements between different sized vessels when the neck diameter is known. Using this formula, an adjusted lip length of 16.85 mm was derived for the feature 80 jar, while the feature 75 jar had an adjusted lip length of 16.65 mm. These measurements are very similar to the mean lip length (16.5 mm) of the Moorehead phase jars at the Julien site in the American Bottom (Morgan 1985:151). Rim height of the large jars ranged from 12.0 to 44.9 mm with a mean of 23.0 mm. Body thickness ranged from 4.1 to 10.1 mm with a mean of 6.5 mm (Table 23).

All of the large jars had angular everted rims (Figure 28a-f) similar to the Type 3 jar defined by Milner (1984:129-133) at the Julien site. The exterior surface colors included buff (n=3) and gray to dark gray (n=3). The Feature 75 rim was buff on one side with dark gray firing clouds, while the opposite side of the jar was dark gray. The vessel interior exhibited a similar color differentiation ranging from buff to dark gray. The other jar interiors were buff to dark gray.

Appendages in the form of small tabs or lugs were attached to two jars. The feature 75 jar (Figure 29a) had a 61 m long tab that extended out approximately 16.5 mm from the top of the vessel lip. An eroded tab also is present on the jar rim from Structural Complex 2 (Figure 28c).

All of the large jars were tempered with a combination of shell and grog. The shell ranged in size from 1 to 4 mm while most of the grog particles were in the 1 to 2 mm range.

The small jar category (Figure 28i-o,q) is less well defined than the larger jars, with four specimens consisting entirely of rim fragments (Figure 28i-l). However, three fragmentary small jars consisting of rims and attached body section were recovered from feature 91 and Structural Complex 2 (Figure 28m-n,q; Figure 30b-d). Some of the individual measurements (thickness, lip length, rim height) taken on the small jars overlapped those of the large jars, but the small jars had consistently lower mean values for these measurements. Body thickness ranged from 4.0 mm to 7.6 mm with a mean of 5.5 mm. Rim height ranged from 5.3 mm to 17.4 mm with a mean of 12.6 mm. The neck diameters of

Figure 29. Jar Rims

a. Large jar, feature 75

b. Large jar, feature 80

c. Jar, Structural Complex 2

d. Red slipped jar rim, Structural Complex 2

e. Jar, Structural Complex 2

f. Red slipped jar rim, Structural Complex 2

g. Red slipped jar rim, feature 42

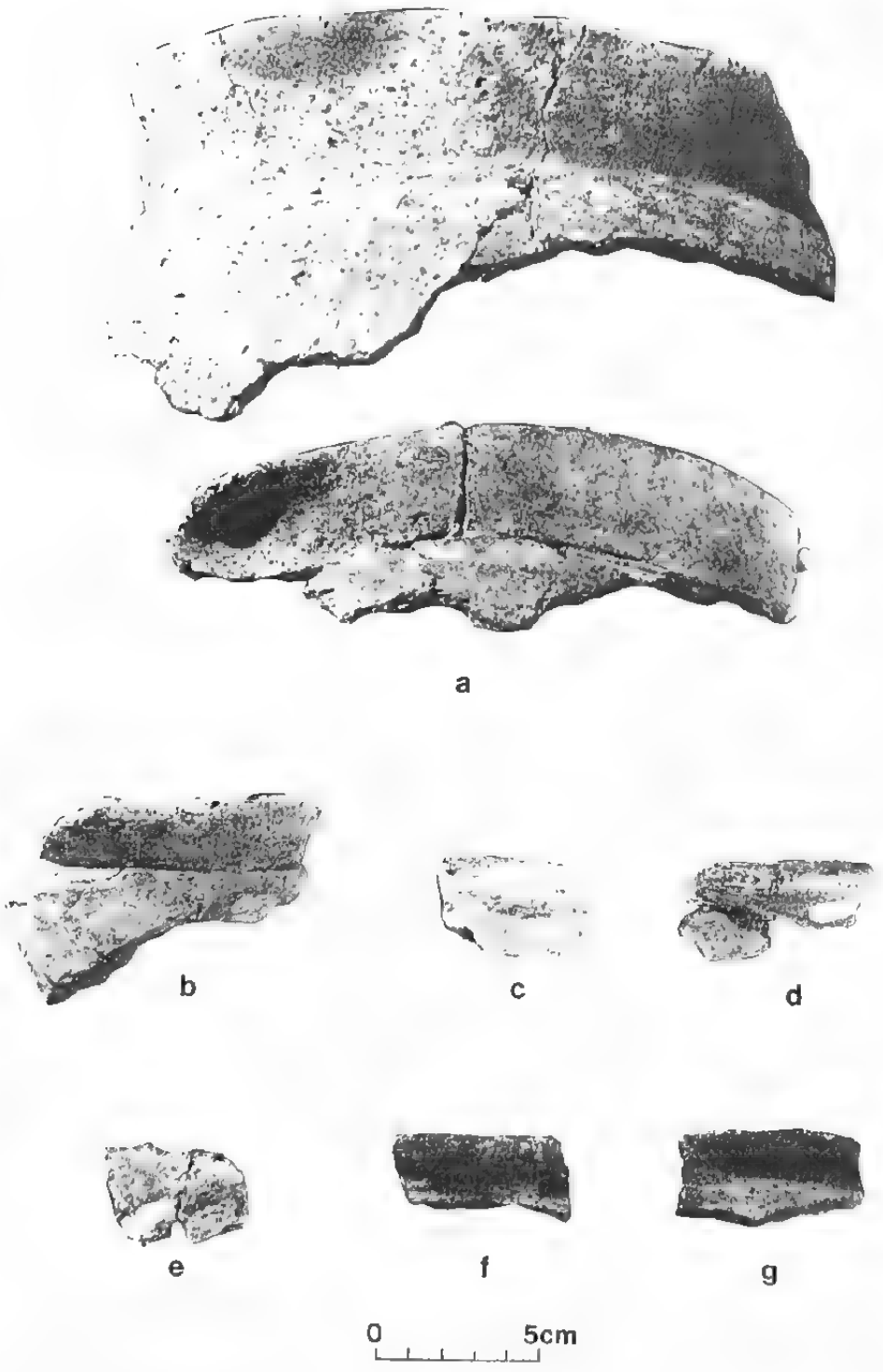


Figure 29. Jar rims.

the small jars were undeterminable; only unadjusted lip length measurements were obtainable. These ranged from 9.3 mm to 21 mm with a mean of 15.8 cm.

All three of the small jars with attached lip sections had everted rims. One was angular (Figure 28n), similar to the large jar, while the other two (Figure 28m,q) had more gradual, rounded lip/body junctions. The two small jars from feature 91 had short, thin rims and finely smoothed bodies. The exteriors were buff with gray firing clouds. The interiors were also buff colored. Additional lower body sherds that attach to one of the feature 91 vessels (Figure 28n) indicate that the vessel had a globular body (Figure 30c). It is possible that this vessel in reality could be a short necked water bottle, but not enough of the vessel was recovered for a positive determination. The shell temper was leached from both of the feature 91 jars, but based on the size of the voids, this temper was 1 to 3 cm in diameter. Grog was present in a minor amount in both vessels. The vessel lips were flat (Figure 28n) and pinched (Figure 28m).

The small jar from Structural Complex 2 (Figure 28q-z; Figure 30d) had a slightly everted rim, a narrow pinched lip, a rounded shoulder, and a small handle. The handle is round, 7 cm in diameter, and attaches at the vessel lip and shoulder. The jar is shell and grog tempered.

Three other jar sections (Figure 28g,o,p) that could not be confidently placed in either the small or large jar categories were recovered. One is a thick, shell-tempered jar rim (Figure 28q) from an excavation unit while the other two specimens are body and shoulder sections from pit features (Figure 28o,p). The jar section from feature 42a (Figure 28o) has a rounded shoulder and a filmed and polished exterior surface. The film varies in color but is predominantly light red/brown with a dark gray area located above the shoulder. The interior is unfilmed and buff in color. The feature 91 jar fragment (Figure 28p; Figure 30b) is the only upper body section of a cordmarked jar identified. The sherd is broken at the rim/body junction (with the rim missing) and at the shoulder (which was rounded). Based on the angle of the break, the jar had an everted angular rim. Most of the sherd surface is covered with vertical z twist cordmarking. A smoothed plain band varying in width from 4 to 6 cm is located immediately above the cordmarking and below the rim/body junction. The shell temper is leached from the sherds but, based on the size of the voids, varied from 1 to 4 mm. Grog was not observed.

Plates/Dishes

Six plate/dish rim sherds and one body sherd were recovered at the Bonnie Creek site (Figure 28u-aa). Interpretation of these sherds as plates was based on : (1) the presence of incised lines on two sherds, (2) smoothed or polished surfaces (all sherds), (3) slipped or filmed surfaces (2 sherds), and (4) the rim edges form partial arcs in plan view (n=3). Three of the rims (Figure 28y-aa) are very small yet are more similar to the plates than either jars or bowls. Lip length and

Figure 30. Vessel Sections

a. Incised plate, feature 44

b. Cordmarked jar, feature 91

c. Small jar, feature 91

d. Small jar, Structural Complex 2

Figure 30. Vessel sections.

rim height measurements were not taken because of the fragmentary condition of the plates.

The most complete example was a section of an incised plate found in feature 44 (Figure 28v; Figure 30a). This was the only plate with a determinable orifice diameter (36 cm). The plate had polished black exterior and interior surfaces except for a small section (shown as clear on the figure) which was a 2.5YR 4/6 red. This sherd was found separately from the rest of the plate and was apparently accidentally refired after the plate had been discarded. The incised design consists of three parallel lines separated at 15 mm intervals that were oriented perpendicular to a fourth incised line. The plate is cleanly broken down the center of the perpendicular line, which is not visible on Figure 30. Temper consists of finely crushed (1-2 mm) shell. The plate is similar to the Well's Fine Incised type of Vogel (1975). If complete, the incised design on the plate would have resembled that of vessel 38 and vessel 1 from the Hill Creek Homestead site (Morgan 1985:27-29, Figure 2.4b, 2.5).

A small section of a second incised plate rim (not illustrated) was recovered from the backdirt following the mechanical stripping. This fragmentary plate rim was broken on three sides, and the vessel lip was missing. The design consists of a vacant triangle of three incised lines with three parallel incised lines intersecting one side of the triangle. A similar design was present on vessel 38 from the Hill Creek Homestead site (Morgan 1985:27, Figure 2.4). The Bonnie Creek site sherd has gray exterior and interior surfaces and is finely tempered with small (1-2 mm) pieces of shell.

The remaining plate fragments consist of undecorated rim and lip sections. Recovery contexts included the mechanical stripping (n=2) and the unit 42 plow zone (n=3). Colors ranged from black to buff. Lip edges varied from rounded (n=3) to flat (n=2). A rim from the backdirt pile had red slipped interior and exterior surfaces, while a rim with a red filmed exterior surface and lip was recovered from unit 42. All of the sherds had polished surfaces. Temper ranged from fine (1-2 mm) to coarse (1-5 mm).

Bowls/Pans

Eight vessels were identified as bowls or pans. Profiles of the four most complete specimens are provided (Figure 28l-o). Recovery contexts included pit features, the Structural Complex 2 house depression, and the site surface. Rim orientation was not determinable for these vessels although the illustrated profiles of the large vessel from feature 75 (Figure 28i) and the bowl from the site surface (Figure 28u) may be correct.

Three of the vessels were identified as pans on the basis of large orifice diameter. The partial vessel from feature 75 had a minimum orifice diameter of 44 cm, while vessels from Structural Complex 2 and feature 43 had diameters of 38 and 36 cm, respectively (Table 23). One other rim fragment from Structural Complex 2 may be part of a pan, but

the specimen is too small for a positive identification. Pan thickness ranged from 5.4 to 9.6 mm with a mean of 7.1 mm. All of the pans exhibited slight thickening of the exterior lip edge, with three having slightly folded rims. Exterior and surface colors varied from buff to gray. Temper was predominantly shell, with grog present in at least one vessel.

Two bowls were identified. Both have blackened surfaces. Whether this represents part of the surface treatment or is the result of use is unknown. The bowl from the site surface had a narrow rounded rim and a minimum orifice diameter of 22 cm (Table 23; Figure 28u). The second bowl consists of a curved body section from feature 83. The small fragment is shell tempered, while both shell and grog are present in the specimen from the site surface.

Miniature Vessels

Two miniature vessels were recovered during the mechanical stripping. One is a complete miniature jar with an everted rim and rounded shoulders (Figure 31a). The vessel is 3.2 cm tall, has a maximum body diameter of 4.6 cm, and has an orifice diameter of 4.2 cm. The vessel exterior is buff colored with orange and black firing clouds. A slight polish is present on the upper vessel body between the shoulder and lip. The interior is buff. Temper consists of coarse shell and grit.

The second specimen consists of a fragment of a small vessel. The specimen is thick (13.0 mm), tempered with fine shell, and has a gray exterior and a buff interior. The fragment has a flattened lip and appears to be from a small bowl (Figure 28bb).

Ceramic Trowel

An intact pottery trowel was recovered from the floor of Structural Complex 1 directly beneath a burned wall pole along the western wall trench (Figures 14b and 31b). The trowel consists of a short handle attatched to a circular disc with an excurvate surface. The disc has a maximum diameter of 89.1 mm and a maximum thickness of 19.1 mm. The handle is approximately 40 mm long with a maximum width of 22.2 mm at its base. Incised scratches are present on the top and side of the handle. In addition, a group of shallow incisions are located on the interior of the disc. All of these incisions appear to be the result of use; however, the type of use which could have resulted in scratches to the interior of the trowel and its handle is unclear. The exterior of the disc is highly polished and smooth from use, and polish is also present on the sides of the handle. Pottery trowels are generally assumed to have been used in the manufacture of Mississippian ceramic vessels, and the polish could be the result of such a use. The curvature of the exterior surface of the disc exactly matches the interior curvature of the body section of the large jar recovered from feature 75 within Structural Complex 2, suggesting that the trowel may have been used in the manufacture of that specific vessel. The recovery of pottery trowels from structures in the till plains is not unusual; a similar trowel was recovered from a burned structure at the Mike Adamson site

Figure 31. Ceramic Artifacts

a. Miniature vessel, mechanical stripping

b. Ceramic trowel, Structure 1b

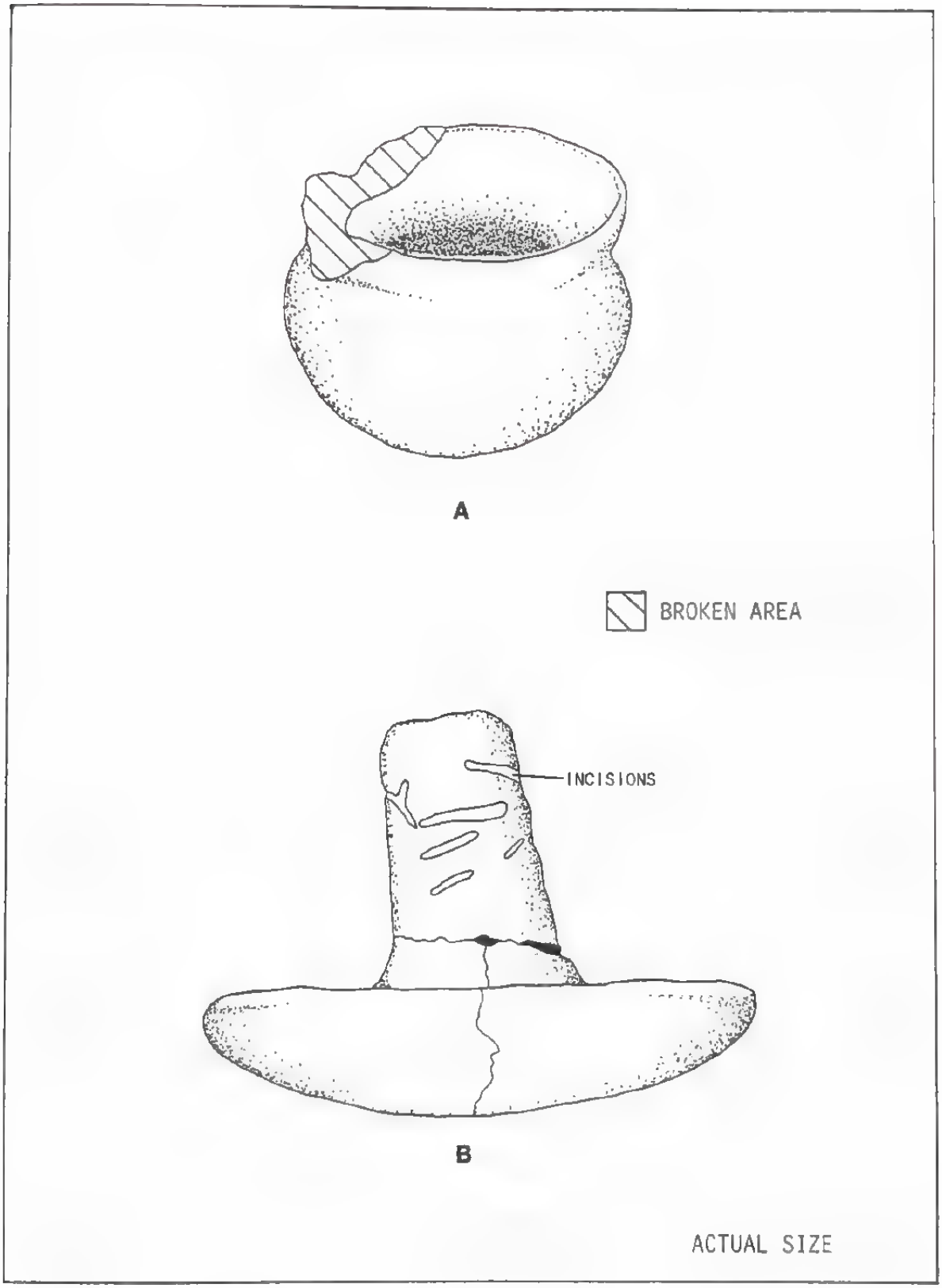


Figure 31. Ceramic artifacts.

(Rl-188) in the Rend Lake reservoir area in Franklin County, Illinois (Wagner and McCorvie 1986).

Conclusions

Very little can be said about the Crab Orchard and Late Woodland ceramics recovered at the site. The Crab Orchard ceramics are identical in surface treatment, color, and temper to more complete specimens recovered at sites 21C4-27 and -132 in the project area. The occurrence of small quantities of Crab Orchard ceramics at multicomponent sites is part of a recurring pattern in the upper Galum Creek valley. However these sites were utilized during the Middle Woodland period, this utilization did not include the construction of subsurface features (with the exception of a single basin at 21C4-35). These sites were most likely utilized as transitory hunting and nut collection camps at which a small amount of material was discarded and no permanent facilities were constructed.

The Late Woodland ceramics are similar to the earlier cordmarked ceramics recovered at the Jamestown site (21C4-14), which is located a short distance south of the Bonnie Creek site. They are dissimilar to the later Dillinger ceramics recovered at that site in terms of thickness. The Late Woodland ceramics at the Bonnie Creek site may have their origin in off-site activities connected with the Jamestown site.

Local Comparisons

In addition to the Bonnie Creek site, Mississippian ceramics have been recovered from the Brune (21C4-3), Snake Tree Cemetery (21C4-9), Jamestown (21C4-14), Cutler (21C4-34), Lightfoot (21C4-35), and Galum Crossing (21C4-29) sites in Burning Star Mine #4. The ceramics from these sites are relatively homogenous and indicative of late (Moorehead and Sand Prairie phase) Mississippian occupations of the upper Galum Creek valley.

Mississippian ceramics from the Brune site (21D3-9) in the Southfield of Burning Star Mine #4 exhibit late characteristics (McNerney 1974:47-57). Eleven (9.6%) of the body sherds were cordmarked, two (2%) were polished, and the remainder (n=102; 88.7%) were plain. Vessel types included cordmarked and plain jars with angled and everted rims, a black filmed plate with an engraved triangular motif on the rim, bowls/pans (McNerney 1974; Plate 2, c-3; g-i), and a fabric-impressed pan. Red slipped sherds were not present in the small (n=116) assemblage (Pulcher, personal communication 1986).

Mississippian ceramics from the heavily vandalized stone grave cemetery site (21C4-9) consisted of material recovered in excavation units, sherds used as chinking in the grave walls, and an intact water bottle. Vessel types included two large jars, a small jar, a plate, and the water bottle. One large jar has a short rim with a rolled lip reminiscent of Stirling and early Moorehead phase Powell Plain vessels in the American Bottom. The second large jar has an angular shoulder

similar to that found on Powell Plain jars. The small jar has a smoothed plain surface, a short everted angular rim, and is virtually identical to the small jar (Figure 28n) from the Bonnie Creek site. The water bottle is brown and black filmed, has a short neck, and is similar (Barr n.d.:60) to a water bottle recovered from the Sand Prairie phase East St. Louis Stone Quarry site cemetery (Milner 1983:56-57; Figure 24:D). As a group, the cemetery ceramics are indicative of a relatively late (A.D. 1150-1400) placement in terms of the American Bottom chronology.

Three Mississippian structural complexes representing nine separate building episodes were identified at the Jamestown site (21C4-14). The small ceramic assemblage from this site consists of material recovered from excavation units and the structure floors. This material has not yet been analyzed, but a cursory examination indicates that pans, everted rim jars, and cordmarked body sherds are represented in the collection. Red slipping is present on some sherds. One large jar with a slightly everted rim, rounded shoulders, and double lugs attatched to the rim was recovered from the floor of a structure dated at A.D. 1210±50 years. A section of a black filmed jar with an angular shoulder was recovered from the same structure.

The Galum Crossing site (21C4-29) was a Mississippian homestead and Late Woodland site located at the northwest edge of the mine. Two structures and associated pit features were located at the site. The large ceramic assemblage from this site exhibits many of the characteristics of the Bonnie Creek site assemblage including large jars with high everted rims, rounded shoulders, and lip tabs; small jars with loop handles; bowls and pans; an incised plate; and cordmarking as a minor surface treatment. Differences between the ceramic assemblages include the absence of filmed, polished, or slipped surfaces and the presence of fabric-impressed sherds at the Galum Crossing site. Powell (n.d.) notes that the eroded condition of the sherds made it impossible to determine if they were from slipped or polished vessels.

The Cutler site (21C4-34) was a Mississippian homestead site with at least two structures located in a dense woods. Vessel types at the site included larger jars with angled and everted rims and red slipped interior lips, a jar with a short rolled lip similar to the Powell Plain type, large pans, and bowl/pan rim fragments. Cordmarked body sherds are present as a minority type.

The Lightfoot site (21C4-35) was located on a heavily eroded ridge spur overlooking Galum Creek. A single Mississippian feature--a structure with very shallow wall trenches--was found at the site. The ceramics from the site predominantly consist of small eroded body sherds recovered from the plow zone. The temporal placement of this Mississippian assemblage is unknown.

Regional Comparisons

Viewed as a group, the ceramic assemblages from Burning Star Mine #4 sites exhibit ceramic traits contemporaneous with the Moorehead (A.D. 1150-1250) or Sand Prairie (A.D. 1250-1400) phases in the American Bottom sequence (Milner et al. 1984:158-186). Moorehead phase attributes include the predominance of angled jar rims over rolled and everted jar rims, red slipped jar lip interiors, and the predominance of curved over angular jar shoulders. Sand Prairie phase ceramic attributes present at the Bonnie Creek site include the occurrence of thickened jar rims and the use of grog and shell tempering. Attributes associated with both the Moorehead and Sand Prairie phases include the use of cordmarking, presence of water bottles and incised plates, and popularity of bowls and pans. Three of the radiocarbon dates from the Bonnie Creek site (A.D. 1220±50; A.D. 1290±50; A.D. 1330±50) span a temporal range of A.D. 1170-1380, supporting a late Mississippian placement. The Bonnie Creek site ceramics also compare favorably with what Hargrave et al. (1983:196-197) have defined as late Mississippian ceramics (cordmarked vessels without angular shoulders, jars with long or everted rims, and plates and bottles) at the Bridges site in the lower Kaskaskia River valley. One of the early Mississippian characteristics (slipped or painted surfaces) of Hargrave et al. (1983:196-197) was present at the Bonnie Creek site but in a context (on the interior of large everted rim jars) that indicates it is not a reliable early characteristic at this site.

The Bonnie Creek site ceramic assemblage differs from those of both the Bridges and Julien sites (Figure 32) in the proportions of vessel types. Unidentifiable vessels form the largest proportion (41.3%) of the assemblage followed by jars (32.7%), plates/dishes (12.0%), bowls/pans (10.3%), and miniature vessels (3.4%) (Figure 33). At the Bridges site, the proportions were jars (63%), indeterminate (18.5%), bowls (12.0%), plates (4.3%), miniature vessels (1.1%), and bottles (1.1%) (Hargrave et al. 1983:Table 20; p. 203), while at the Julien site the proportions were jars (51.1%), bowls and pans (28.8%), unidentifiable (6.1%), water bottles (2.7%), and plates (0.9%). Taken at face value, these comparisons indicate that jars form a much lower proportion of the ceramic assemblage at the Bonnie Creek site than at the Bridges or Julien sites; bowls and pans occur in approximately the same proportions at the Bonnie Creek and Bridges sites; and plates form a much higher proportion of the assemblage at the Bonnie Creek site. These comparisons may be misleading due to the number (n=16) of unidentifiable eroded small rims recovered from the excavation units and mechanical stripping at the Bonnie Creek site. Exclusion of these very small rims from consideration changes the proportions of jars to 55.8% and bowls to 10.3 %, values which are close to those at the Julien site. The proportion of plates (12.0 %) at the Bonnie Creek site is much higher than at the Bridges or Julien sites. The small number (n=36) of identifiable vessels at the Bonnie Creek site may not be large enough to obtain reliable information about the prevalence of plates in the upper Galum Creek valley.

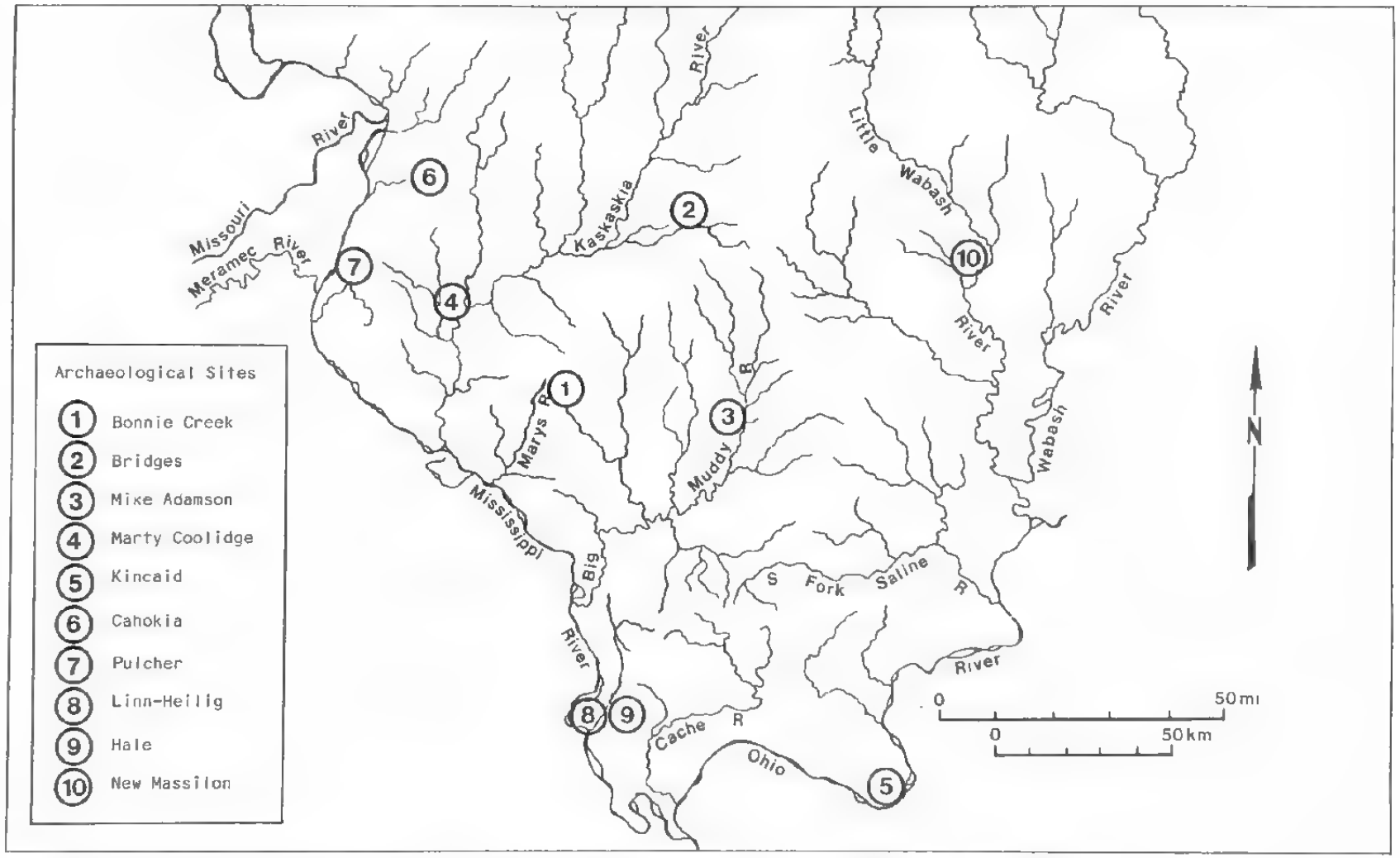


Figure 32. Selected Mississippian sites, Southern Illinois.

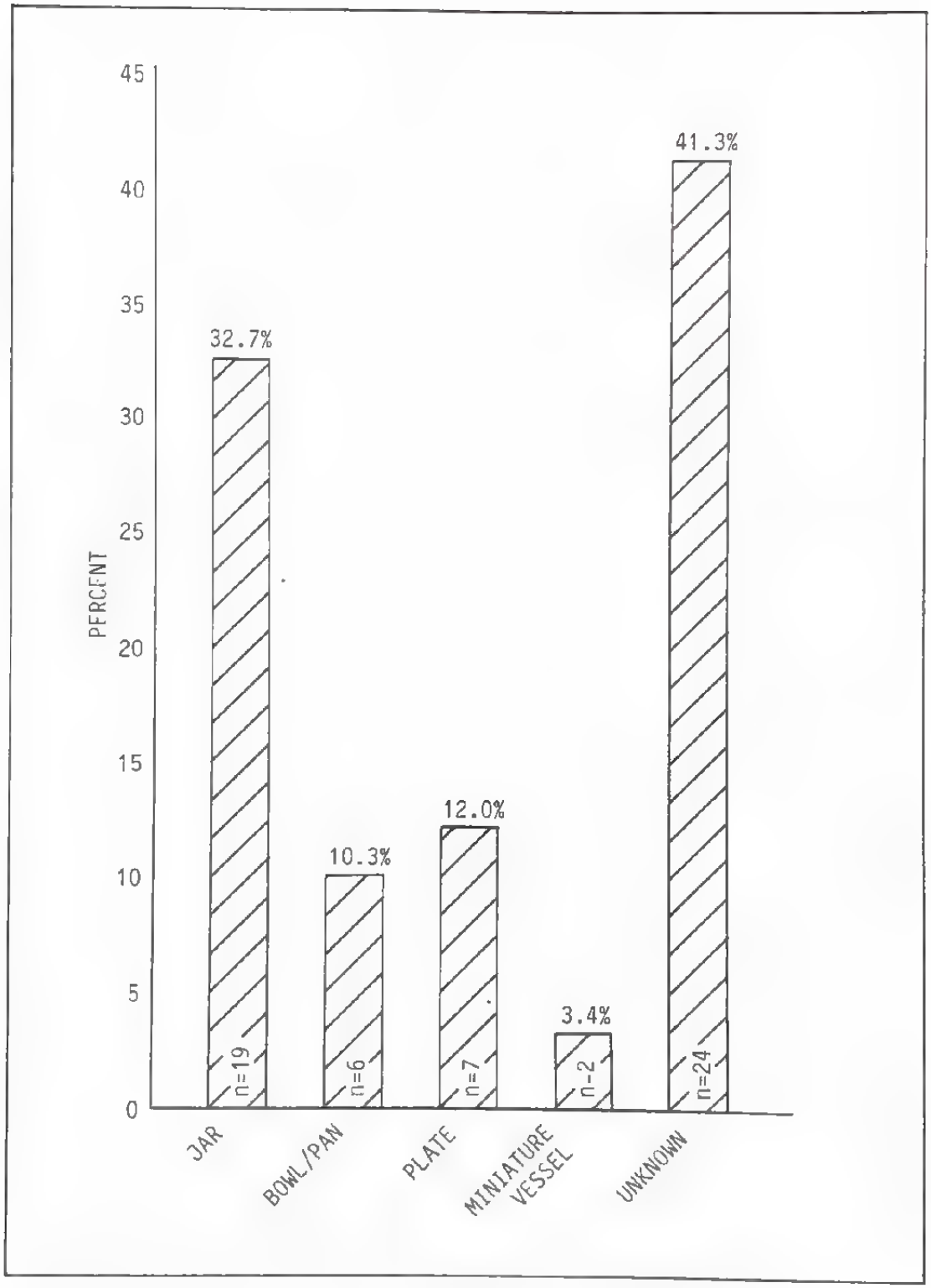


Figure 33. Proportions of vessel types, Bonnie Creek site.

In comparing the Bonnie Creek site ceramics with those from sites in the main channel of the Big Muddy River, the most obvious difference is the lack of cordmarking in that area. Galum Creek is a tributary of the Big Muddy River, yet cordmarking is very rare at Mississippian sites in the Rend Lake area of the Big Muddy River drainage (Pauketat et al. 1984; Wagner and McCorvie 1986). Excavations at the Mike Adamson site recovered over 4,000 plain ceramics and only one cordmarked sherd which was actually smoothed over plain but the cord impressions had not been completely obliterated (Wagner and McCorvie 1986). The ceramic assemblage included jars with angled and everted rims, bowls and pans, plates, and fabric-impressed salt pans. Vessel appendages included lugs, tabs, handles, and an effigy adorno. Polished plate, jar, and bowl rims were present as was one plate with a red slipped interior (Wagner and McCorvie 1986:120). The Mike Adamson site ceramic assemblage is very similar to that reported from other sites in the area (Denny 1972; Pauketat et al. 1984:30; Woods and Denny 1980). The angled and everted jar rims, prevalence of plates and shallow bowls, and effigy adornos suggest a Moorehead or Sand Prairie placement in terms of the American Bottom sequence. However, the cordmarked vessel surfaces characteristic of late Mississippian ceramics in the American Bottom are virtually nonexistent.

The Bonnie Creek site and Mike Adamson site ceramic assemblages are very similar except for the lack of cordmarking at the latter site. Given the relatively close proximity of the sites to each other (approximately 55 km), the difference in surface treatment is intriguing. The presence of cordmarking in the Galum Creek valley may indicate a closer association of this area with the Mississippian complexes of the American Bottom as opposed to those of the Big Muddy River valley.

CHAPTER V. LITHIC ANALYSIS

Brad H. Koldehoff

Introduction

Lithic tools and the debris from their manufacture are the most consistently preserved residue of extinct cultural systems. Differential preservation of lithic remains are rare, and despite certain cultural and noncultural site formation processes, a fairly complete record of the lithic tools and debris deposited by the inhabitants of a site can usually be recovered. It is this fact that imparts great interpretive potential to the "lithic record" of extinct cultural systems.

All lithic materials from the Bonnie Creek site (21C4-46) were subjected to technological, functional, and source area analysis; however, lithics recovered in flotation samples were not analyzed except for tools. The identification and description of lithic industries, site activities, and lithic procurement strategies were prime objectives.

The Bonnie Creek site, predominantly a single component Mississippian homestead, provides an excellent opportunity to examine Mississippian technology on the till plains of southwestern Illinois. The Bonnie Creek site and other Mississippian occupations in the upper Galum Creek drainage may have occupied the eastern interior periphery of the Cahokia system centered in the American Bottom. These sites could provide information critical to the delineation of Cahokia's sphere of influence and the character of the interaction between Cahokia and interior populations. In addition, the Galum Creek data provide an opportunity to expand our understanding of Mississippian adaptations to till plain environments. Consequently, a final objective of this chapter will be to place the Bonnie Creek site lithic assemblage in a regional context by briefly comparing and contrasting its lithic industries and procurement patterns with those of Mississippian occupations in the American Bottom and portions of the Kaskaskia, Big Muddy, and Wabash drainages.

Research Orientation

Before presenting the results of analysis, it is important to outline and clarify some terms and concepts that were an integral part

of the analysis and interpretation of the lithics from the Bonnie Creek site.

For this chapter, "technology" is defined as a society's general means of coping with its environment, which includes the procurement and processing of raw materials and the production and maintenance of tools and facilities. Technological analysis of stone tools examines the methods of tool production and maintenance and the order of their execution. Chert debitage is one of the principle bodies of data drawn upon in the technological analysis of chipped stone industries. Chipped stone tool production is a subtractive process that generates a continuum of distinctive byproducts (i.e., debitage and production failures), and these byproducts allow analysts to reconstruct reduction sequences or production trajectories. Production is only one stage in the "life cycle" of lithic materials (Figure 34).

An "industry" is defined as "a manufacturing or productive enterprise focusing on a raw material and involving certain common means of processing that material" (Sheets 1975:372). With this concept of industry, it is easy to define a chipped stone industry, groundstone industry, ceramic industry, and so on. However, more specific types of industries can be delineated. For example, the chipped stone industry of a single culture could have contained several more discrete industries, e.g., biface industry, blade/core industry, and flake tool industry. A single industry often employs several production techniques. A "technique" is a particular method or set of procedures employed to produce a specific product or result. An example of a technique is the bipolar flaking method which is used to detach flakes from small cobbles or fragments of chert.

The final concept to be considered is the "organization of technology." It can be defined as the way in which a culture or society designs its tools and structures tool production, use, and maintenance so that the tools can respond effectively to the demands placed upon them by the society in its daily interaction with the environment (cf. Binford 1977, 1978, 1979). Reconstructing the technological organization of a culture can act as a useful heuristic device, for it forces the analyst to consider a broad range of variables and their interrelationships. Some of the key variables or factors a society must take into account in the organization of its technology include: (1) types of raw materials available, (2) the distance to raw material sources, (3) the basic food getting strategies, (4) the seasonal availability and accessibility of biotic and mineral resources, (5) group mobility, and (6) social relations with neighboring groups (e.g., access to resources in adjacent territories via alliances and exchange).

The actual design and production of stone tools is decision-making process, and several important variables must be considered: (1) tool portability, (2) raw material selection, (3) amount of time and energy expended in production, (4) tool flexibility in regard to function and recycling, and (5) the degree to which a tool should be designed for repeated maintenance and reuse. The concept of industry is advocated as

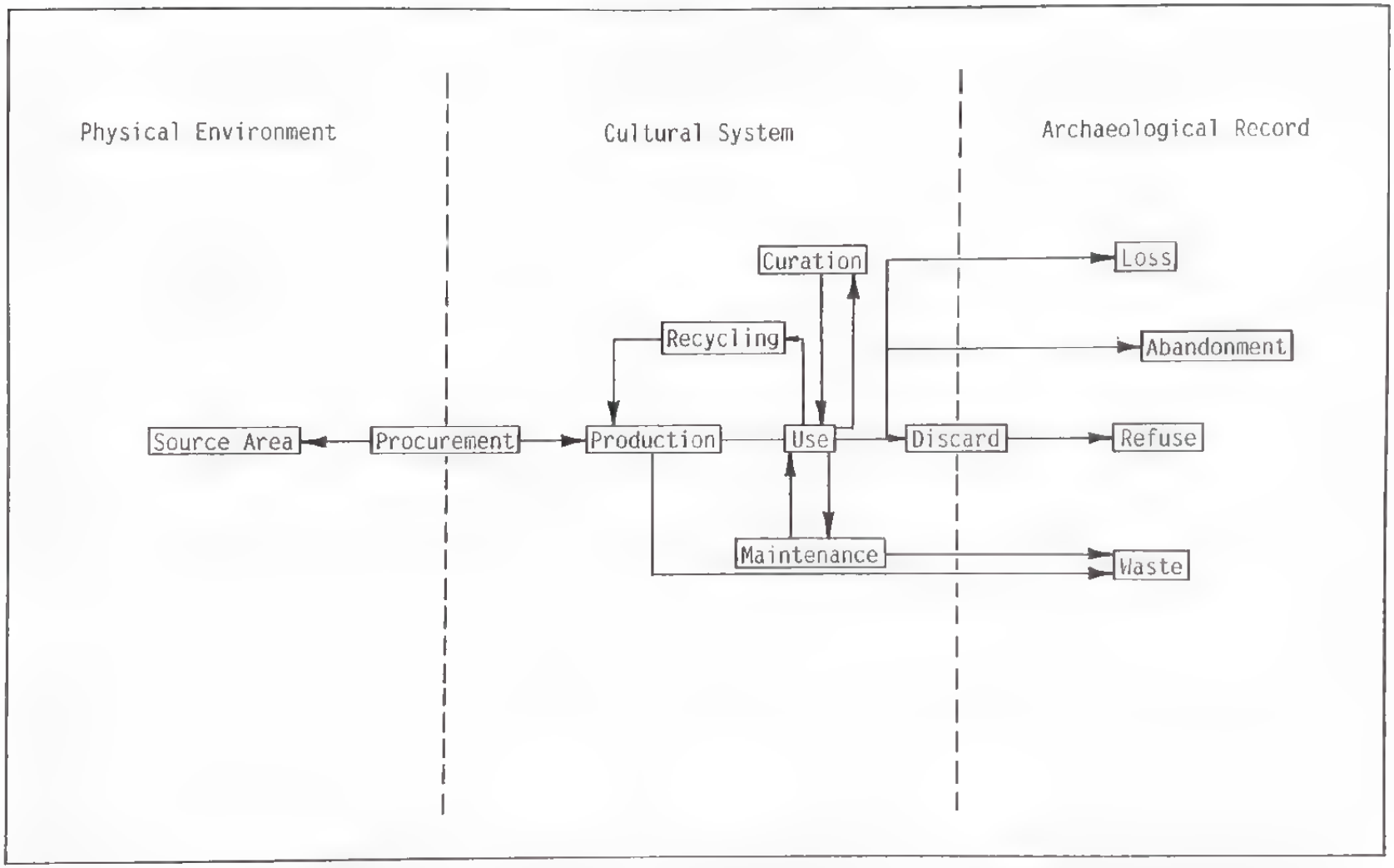


Figure 34. Simplified flow model of the life cycle of lithic materials in a cultural system (adapted from Schiffer 1972: Figure 1 and Gregg 1975: Figure 47).

the most convenient method of investigating how a culture organizes its technology.

Lithic Procurement

Source area analysis of all lithic tools and debris identified nine chert types and several rock and mineral types. All artifacts were assigned to specific types on the basis of macroscopic characteristics with the assistance of an extensive type collection (Koldehoff 1986a). Descriptions of each raw material type are below, followed by a reconstruction of lithic source areas in the upper Galum Creek drainage and a discussion of Mississippian lithic procurement strategies at the Bonnie Creek site.

Chert Types

The nine types that were identified have known source areas in southern Illinois and adjacent portions of Missouri (Figure 35). Chert artifacts that could not be assigned to a specific chert type were placed in an indeterminate category. Chert types from the entire site were quantified by weight to the nearest 0.5 g, and totals and percents by weight are shown in Tables 24 and 25. Only brief descriptions of each type are presented; more details can be found in several overviews on southern Illinois cherts (Koldehoff 1983, 1985b; May 1984; Spielbauer 1976).

Glacial Till. Deposits of glacial till south of Springfield, Illinois, predominantly belong to the Illinoian stage of Pleistocene glaciation. The southern extent of glaciation in Illinois is demarcated by the northern edge of the Shawnee Hills. The most common till unit in southern Illinois is the Glasford Formation (Willman and Frye 1970). It commonly contains pebbles and cobbles of chert as well as other rock types. Chert cobbles (1) rarely exceed 10 cm in any dimension, (2) usually possess a thin cortex which is often smoothed or polished, and (3) the quality of the chert is generally low.

A large percentage of the chert cobbles that occur in the Glasford Formation exhibit macroscopic attributes nearly identical to those of Burlington chert (Koldehoff 1983). Nevertheless, glacial cherts can generally be distinguished from Burlington chert due to their lower quality (i.e., grainy texture and frequent inclusions) and differing cortex. However, artifacts manufactured from high quality glacial chert which do not possess cortex are difficult to distinguish from average fragments of Burlington. Consequently, during analysis artifacts that were too ambiguous in their attributes were relegated to the indeterminate category.

Burlington. Derived from the Burlington Limestone, this chert commonly occurs as nodules or large bedded blocks either within limestone matrices or as residuum. It ranges in quality from grainy and often highly fossiliferous to very smooth and homogeneous. Cortex is frequently thick and coarse. The coloration of Burlington chert

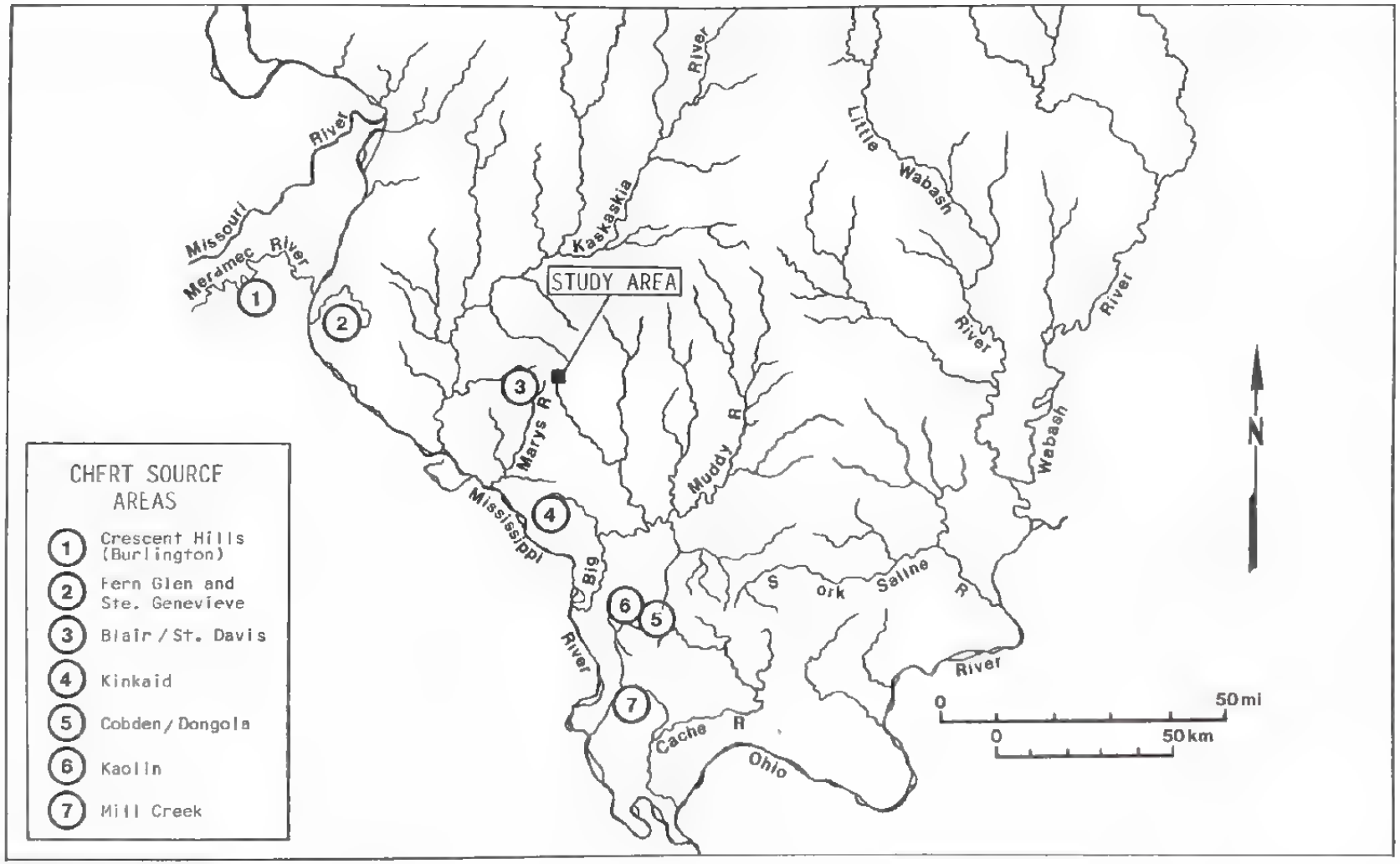


Figure 35. Chert source areas.

Table 24. Chert Type Frequencies.*

Chert Type	Geologic Formation	Weight in Grams	Percent by Weight
Glacial Till	Glasford	1383.5	34.00
Burlington	Burlington	685.0	16.80
Blair/St. David	St. David	641.5	15.70
Mill Creek	Salem	406.0	10.00
Cobden/Dongola	St. Louis	161.5	4.00
Kaolin	?	89.0	2.10
Kinkaid	Kinkaid	68.5	1.60
Fern Glen	Fern Glen	29.0	0.70
Ste. Genevieve	Ste. Genevieve	3.0	0.07
Indeterminate	?	609.0	15.00
Total		4076.0	99.97

* weighed to nearest 0.5 g

Table 25. Chert Frequencies by Features.

Provenience	Chert Types*										
	Glacial Till	Burlington	Blair/St. David	Mill Creek	Cobden/ Dongola	Kaolin	Kinkaid	Fern Glen	Ste. Genevieve	Ind.	Total
General Surface	687.5	300.0	310.5	118.0	73.5	35.0	35.5	16.5	00.0	246.0	1822.5
Excavation Units	242.0	90.0	99.5	132.0	45.5	3.5	10.5	--	00.0	155.5	778.5
Subtotal "A"	929.5	390.0	410.0	250.0	119.0	38.5	46.0	16.5	00.0	401.5	2601.0
Percent by Weight	35.7	15.0	15.8	9.6	4.6	1.5	1.8	0.6	00.0	15.4	100.0
Structural Complex 1	309.0	59.0	76.0	40.5	15.0	00.0	10.0	1.5	2.0	84.0	597.0
Structural Complex 2	119.0	116.0	29.5	58.5	10.0	22.0	7.5	11.0	00.0	76.5	450.0
Pit Features											
#3	00.0	00.0	00.0	0.5	00.0	00.0	00.0	00.0	00.0	0.5	1.0
#6	1.5	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	1.5
#7	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	1.0	1.0
#42	10.5	70.0	9.5	6.5	9.0	00.0	4.0	00.0	00.0	20.5	130.0
#44	00.0	2.5	36.5	00.0	00.0	00.0	00.0	00.0	00.0	10.0	49.0
#47	00.0	00.0	00.0	00.0	6.5	00.0	00.0	00.0	00.0	00.0	6.5
#57	6.0	0.5	1.5	00.0	2.0	4.0	0.5	00.0	00.0	2.0	16.5
#75	6.0	12.5	00.0	2.5	00.0	00.0	00.0	00.0	00.0	00.0	21.0
#80	1.0	9.0	00.0	26.0	00.0	00.0	00.0	00.0	00.0	5.0	41.0
#81	00.0	10.0	00.0	21.0	00.0	00.0	00.0	00.0	00.0	0.5	31.5
#83	00.0	00.0	0.5	0.5	00.0	00.0	0.5	00.0	00.0	0.5	2.0
#91	1.0	13.0	78.0	00.0	00.0	24.5	00.0	00.0	1.0	7.0	124.5
#93	00.0	2.5	00.0	00.0	00.0	00.0	00.0	00.0	00.0	00.0	2.5
Subtotal "B"	454.0	295.0	231.5	156.0	42.5	50.5	22.5	12.5	3.0	207.5	1475.0
Percent by Weight	30.7	20.0	15.7	10.6	3.0	3.4	1.5	0.8	0.2	14.0	99.9
Total	1383.5	685.0	641.5	406.0	161.5	89.0	68.5	29.0	3.0	609.0	4076.0
Percent	34.0	16.0	15.7	10.0	4.0	2.1	1.6	0.7	0.07	15.0	99.97

*Weighed to the nearest 0.5 g

commonly is shades of white, gray, and occasionally brown, but it should be noted that the macroscopic characteristics of Burlington varies between source areas. The largest, most heavily utilized source nearest to Galum Creek is the Crescent Hills area of east-central Missouri (Figure 35) (Ives 1975, 1984). Certain color patterns that occur in Crescent Hills chert are highly distinctive.

Blair/St. David. This chert has only recently been identified (Fraser 1982). It occurs as a discontinuous unit within the St. David Limestone, which is Pennsylvanian in age. Blair is named after a small community in eastern Randolph County situated near the type section exposed along Little Mary's River (Figure 35). It is suggested here that Blair chert be referred to as St. David chert or Blair/St. David to follow the strategy of using geologic parent formation names to refer to cherts. This procedure increases the information conveyed while decreasing the number of nonformation names (which cannot be found in stratigraphy handbooks or on geologic maps) that will become ingrained in the archaeological literature (e.g., Mill Creek chert).

Blair/St. David chert occurs as bedded lenses within limestone matrices, blocky residuum at outcrops, in stream gravels near outcrops, and possibly in local glacial till deposits. Quality varies widely from massive grainy blocks nearly indistinguishable from limestone to lenses of smooth vitreous material that is often semitranslucent. Earthy shades of brown and gray are the common colors of low quality material, while high quality material exhibits brighter shades of gray as well as blue. A major drawback to the exploitation of St. David chert is that most outcrops are highly fractured. The exact distribution of St. David chert exposures is unknown.

Mill Creek. Occurring almost exclusively as long, flat nodules either in bedrock or as residuum, Mill Creek chert is generally believed to be derived from the Salem Limestone. Its texture is grainy, and generally its color is shades of brown and gray with banding and mottling common. The principle source of this chert is Mill Creek and adjacent streams in southern Union and northern Alexander counties (Figure 35). Mill Creek chert was intensively exploited by Mississippians for the production of large bifaces, e.g. hoe, adze, and knife blades, that were widely distributed throughout the Midwest and Southeast (Winters 1981).

Cobden/Dongola. This dark colored, high quality nodular chert was exploited throughout much of prehistory in southern Illinois and is believed to be derived from the St. Louis Limestone. The best known source area of this chert is Clear Creek in Union County (Figure 35).

Kaolin. This chert type occurs entirely as residuum which appears to have been redeposited from Paleozoic bedrock. Due to its residual nature, its parent formation is unknown. Kaolin chert is highly variable in color and texture, and its prime source area is Iron Mountain along Clear Creek in Union County (Figure 35). Kaolin chert was also utilized by Mississippians to manufacture large bifaces.

Kinkaid. Kinkaid chert is derived from the Kinkaid Limestone, which has numerous exposures in southern Illinois. The common variety of Kinkaid chert is highly fossiliferous and appears as *in situ* lenses or as residual blocks. Its texture is generally grainy, and its color is brown, gray, or blue. The sources closest to the study area are in southwest Randolph and northwest Jackson counties.

Fern Glen. Generally smooth in texture, Fern Glen chert contains occasional fossils and ranges in color from dark green and purple to light green and gray. It is derived from the Fern Glen Limestone, which directly underlies the Burlington Formation and has exposures in western Monroe County (Figure 35) and adjacent portions of Missouri.

Ste. Genevieve. Ranging in color from light brown and red to light gray and medium blue, Ste. Genevieve chert outcrops in the Ste. Genevieve Limestone in western Monroe and Randolph counties (Figure 35). Its texture ranges from grainy and fossiliferous to smooth and lustrous in appearance. Ste. Genevieve chert has been referred to as "Root Beer" chert and was frequently utilized in the American Bottom region.

Indeterminate. Artifacts that could not be identified as belonging to an established chert type were placed in this category.

Rock and Mineral Types

Rock and mineral types were segregated into eight categories, and most types were quantified by weight to the nearest 1.0 g. Brief descriptions of each category follow.

Igneous/Metamorphic. Rock types such as granite, basalt, diorite, and quartzite only occur naturally in Illinois as cobbles and pebbles in glacial till deposits. These rock types are hard and resistant and functioned well as tools for grinding, pounding, and crushing. They also functioned well as hearth stones and could be worked into a variety of formalized tools by pecking and grinding.

Sandstone. This sedimentary rock type, as well as limestone, is a common bedrock in Illinois, and much of the bedrock surface of interior southern Illinois is composed of Pennsylvanian system sandstones and limestones (Hopkins and Simon 1975). Sandstone is composed of cemented quartz grains. Its texture is coarse and ideal for grinding and abrading. Sandstone also could be used for hearth stones (i.e., heat retention).

Limestone. This sedimentary rock type is usually fine grained, loosely compacted, and easily eroded. It can be fashioned into groundstone tools but functions best as hearth stones.

Shale. Only a small amount (6.0 g) of this sedimentary rock was recovered from the Bonnie Creek site. Nevertheless, it was frequently used in conjunction with slabs of limestone or by itself in the construction of stone box graves uncovered at local Mississippian cemeteries.

Limonite. This low grade, earthy form of iron ore occurs commonly in sedimentary rock formations (e.g., local sandstones) and has been found in local glacial till exposures (Fraser n.d.). Its primary use was in the production of pigments (e.g., red ocher).

Hematite. One piece of hematite was recovered from the site. It weighs 12.6 g, was found in Structural Complex 2, and appears to be the neck portion of an Archaic or Woodland plummet.

Galena. One small cube (25.0 g) of this mineral was recovered from the site. It was found next to feature 71, the western wall trench of Structure 2a. Galena is most frequently interpreted as a source for pigment.

Copper. This exotic material is represented at the site by one tiny (< 1 cm), badly weathered fragment recovered from feature 69 in Structural Complex 2.

The Lithic Landscape

With regard to raw material availability in the upper Galum Creek drainage, a fairly wide assortment of material outcrops along Galum Creek's channel and those of its tributaries (Figure 3). Several exposures of limestone, sandstone, and shale have been recorded. Sandstone is apparently concentrated approximately 2 km northwest of the Bonnie Creek site, while exposures of limestone and shale are within a kilometer to the south. Data for bedrock outcrops were obtained from Consolidation Coal engineers, and no outcrops have been reported on Bonnie Creek north of 21C4-46.

Bedrock in the Galum Creek drainage is entirely Pennsylvanian and is blanketed with a thick sequence of Pleistocene sediments and recent soils. Illinoian till is commonly exposed along the base of cutbanks in Galum and Bonnie creeks. However, it is highly variable in content, ranging from dense concentrations of pebbles and cobbles in silty or sandy clay matrices, to massive, fine grained matrices with only occasional pebbles (cf. Fraser n.d.)

During the course of research in the upper Galum drainage, limited efforts were made to locate glacial till exposures with concentrations of cobbles. One such exposure was recorded and sampled (Figure 3). It is situated at the base of a high cutbank along Bonnie Creek approximately 2 km northeast of 21C4-46. Igneous/metamorphic cobbles of varying size were present as well as chert cobbles, limonite concretions, and numerous chunks of local bedrock. The chert cobbles did not exceed 10 cm and were macroscopically identical to cobbles collected from known outcrops of the Glasford Formation.

In a study that examined the availability of glacial cobbles in upper Galum Creek and adjacent areas of Mary's River, Fraser (n.d.) found greater numbers of cobble-rich exposures in Mary's River. The materials available were identical to those in Galum Creek, but the

increased number of sizeable cobbles was attributed by Fraser to the presence of an area of ridged drift, or Hagarstown till, a member of the Glasford Formation. Hagarstown deposits are fairly discrete concentrations usually of gravelly till that apparently represent glacio-fluvial features such as kames and eskers (Jacobs and Lineback 1969).

The one resource absent in the Galum Creek drainage is high quality chert, particularly large pieces. Cherts in the glacial till are variable in quality and limited in size. It is possible that outcrops of Blair/St. David chert may occur somewhere in the drainage, but no outcrops or workshop sites have been located. The closest source would be some 20 km to the west in the Mary's River drainage. Consequently, chert, a raw material essential for everyday household activities, had to be obtained, to some degree, outside of the drainage. The implications of this fact will be examined in the next section.

In summary, a rather clear picture of the prehistoric lithic landscape of the upper Galum Creek drainage can be reconstructed by extending recent geologic data back in time. Certainly, bedrock outcrops and till exposures have been buried and eroded throughout time; yet, the basic composition of these deposits and the frequency of their exposure have probably varied little with time. Although Galum Creek and its tributaries are quite silty, scattered igneous/metamorphic and chert cobbles and chunks of local bedrock would have occurred in the stream channels on gravel bars. Large quantities of specific raw materials could have been regularly procured from known outcrops except for chert and exotic minerals (i.e., copper, hematite, and galena).

Mississippian Procurement Strategies

It is reasonable to assume that Mississippians in the till plains of southern Illinois were aware of most of the bedrock outcrops and till exposures and scheduled them into their hunting and gathering forays. It is also likely that materials were obtained, to some extent, by direct procurement trips. However, the distance covered by these direct procurement trips is difficult to determine. From the other chapters in this report, it is clear that the inhabitants of the Bonnie Creek site were horticulturalists who built fairly permanent structures. Some geographers (e.g., Chisholm 1968) have noted that most sedentary horticulturalists cannot regularly exploit a catchment greater than 1 to 2 km efficiently. Therefore, it is argued that it was logistically more efficient for the inhabitants of the Bonnie Creek site and other till plain Mississippians to acquire high-quality cherts and other exotic goods (e.g., minerals, marine shell, and nonlocal ceramics) through an exchange network (cf. Koldehoff 1986b). It is likely that more mobile Archaic and Woodland populations acquired quality cherts through an embedded procurement strategy (Binford 1979) but that Mississippians were more sedentary and tied closely to the local environment.

A total of 4,076 g of chert was recovered from the Bonnie Creek site (Tables 24 and 25), and 609 g, or 15%, could not be assigned to

specific chert types. This high total can be attributed to the overlap in attributes between high quality till cherts and Burlington chert; the majority of Burlington chert was identical to chert from the Crescent Hills source area. Only a few artifacts diagnostic of earlier cultures were recovered from the site; thus, the figures in Tables 24 and 25 can be considered characteristic of Mississippian chert selection and procurement. To formally test this hypothesis, the totals of each chert type from non-Mississippian contexts (i.e., mechanical stripping and random units) shown in Table 25 (subtotal "A") were compared with a Chi-square test to the totals from Mississippian features shown in Table 25 (subtotal "B"). It was found that the occurrence of chert types by weight is not significantly different between the mechanical stripping and excavation units and the Mississippian features (Chi-square = 52.23, df = 9; $p < .005$) (Figure 36).

The dominant chert used at the Bonnie Creek site was glacial till (34%). This is understandable as it was the most readily available. However, in gross terms, its frequency is equal to or less than the second or third most popular cherts--Burlington (16.8%) and Blair/St. David (15.7%). Its dominance is partly due to the fact that chert types were quantified by weight, and one large core which weighed 385.5 g, with fewer than 10 flakes removed, was recovered. In contrast, the largest artifact of Blair chert did not exceed 100 g, and the largest artifact of Burlington did not exceed 50 g. All three cherts occurred at the site mainly in the form of cores, flake tools, and debitage; Burlington also occurred as adze resharpening flakes.

Mill Creek chert was the fourth most popular chert (10%) and occurred primarily as hoe flakes, utilized hoe flakes, and recycled parts of hoe blades. After Mill Creek, the remaining five cherts combined represent less than 10% of the assemblage (Table 24). It is likely that much of the Cobden/Dongola and Kinkaid cherts were the result of Mississippians scavenging bifaces and large flakes from nearby Woodland sites (e.g., 21C4-14). Kaolin chert occurs mainly at the site in the form of adze resharpening flakes, debitage, and flake tools. It was most likely procured along with Mill Creek chert as large bifaces. Fern Glen and Ste. Genevieve cherts are present in only trace amounts (Table 24), but they are important because they represent contact with the American Bottom.

A brief examination of chert type distributions among features shows patterns similar to the overall site assemblage, with only some minor variation (Table 25): (1) Burlington, Mill Creek, and Kaolin were more common in features; (2) both structural complexes are similar except that glacial chert is dominant in Structural Complex 1 (ca. 50%) (with Blair and Burlington nearly equal), and Structural Complex 2 is dominated by both Burlington (ca. 25%) and glacial till (ca. 25%), with fair amounts of Mill Creek and Blair present. Only two pieces of Ste. Genevieve chert were recovered, a flake from Structural Complex 1 and an arrow point from a nearby pit feature (91). It is interesting that Fern Glen chert was recovered from only the two structural complexes and the mechanical stripping. A final point of interest is that the two pit features with the most lithics are dominated by different chert types.

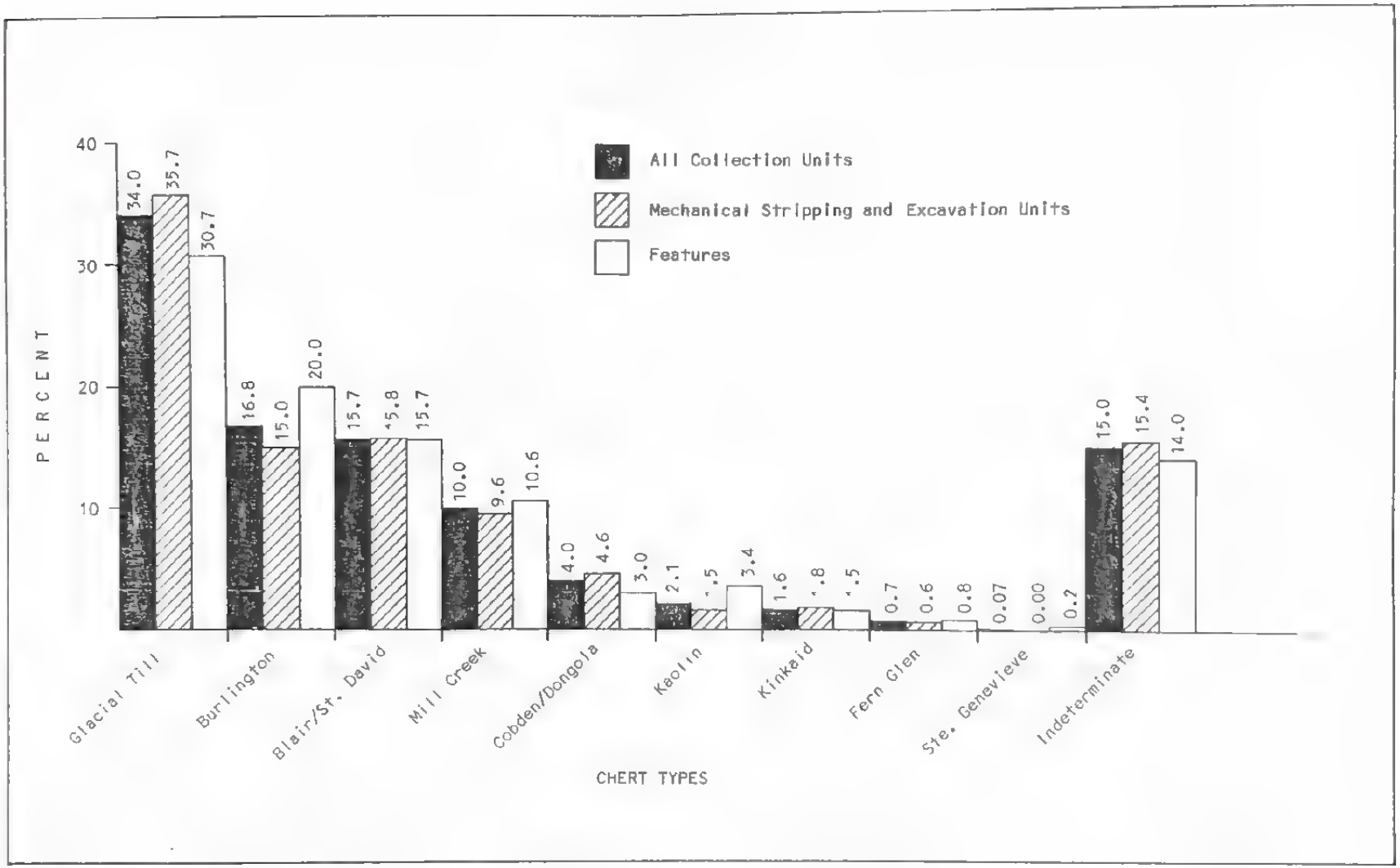


Figure 36. Chert type frequencies.

Feature 42 contains 50% Burlington, while feature 91 contains 60% Blair/St. David.

In sum, 34% of the chert from the Bonnie Creek site could have been procured from local stream channels. Nearly 16% was acquired from 15-20 km away in the Mary's River drainage (Figure 35), nearly 17% was acquired from the Crescent Hills just west of the American Bottom, a little over 17% came from sources 40-100 km to the south, and just under 1% was obtained from the southern rim of the American Bottom.

It is likely that large Burlington chert cores and finished adze blades, as well as small amounts of Fern Glen and Ste. Genevieve chert, were obtained through exchange from groups in the American Bottom. Blair/St. David chert may have been obtained by direct procurement, especially if outcrops occur closer than 20 km. Mill Creek hoe blades, as well as Kaolin and Mill Creek adze blades, were assuredly obtained through a regional exchange network. Union County mound centers such as Hale and Linn-Heilig (Figure 32) probably controlled production and distribution of these large bifaces (May 1984; Winters 1981). However, it is also likely that Cahokia played a role in large biface distribution. All groundstone tools were manufactured from local sources (Figure 3), but hematite, galena, and copper were undoubtedly acquired through exchange. Yet, float copper in glacial till deposits cannot be overlooked as a source of this raw material (Goodman 1984:8-9).

It is simple to propose that nonlocal cherts and exotic materials were acquired through exchange. However, it is difficult to identify the type of exchange system (or systems) in operation and the nature of the social dynamics involved. The lithic materials indicate that two levels of exchange were likely. One level occurred between households and local populations in which Blair/St. David and perhaps some glacial cherts were exchanged. The second level would have been a widespread regional system through which nonlocal commodities were obtained; how Galum Creek populations were tied into the system is unknown. Even so, it is evident that populations in the American Bottom were frequent trading partners with the inhabitants of the Bonnie Creek site. Cahokia apparently controlled the distribution of Crescent Hills chert, and Blair/St. David chert has been recovered from the Cahokia site (Koldehoff 1985a). Further research is required to test these interpretations. Nevertheless, it is clear that the inhabitants of the Bonnie Creek site had some type of contact with groups to the south in Union County and with Cahokia to the west or one of the centers in the southern American Bottom (e.g., Pulcher site) (Figure 32).

Lithic Industries

The goals of this section are to: (1) briefly describe the artifacts in the tool and debris categories, and (2) place these materials within the context of their appropriate industry. In the following section, these data will be examined with regard to site activities.

Chipped Stone Tools

Bifaces (n=65). A total of 65 bifaces was recovered from the site (Tables 26 and 27, Figure 37). Forty were found by mechanical stripping and in random units, and 25 were from Mississippian features. Twenty four of the bifaces are intact or nearly so, and 41 are damaged. Twenty seven of the bifaces could be classed as small arrow points; 10 were larger specimens assignable to Archaic and Woodland point types, and 28 were too badly damaged to be classified (Table 26). It must be noted, however, that nearly all of the fragments in the latter grouping more closely resemble bits and pieces of Archaic and Woodland dart points and knives than small arrow points. Even so, one specimen is noteworthy--a midsection of a Mill Creek chert biface severely damaged by fire that may represent a portion of a Ramey knife.

Examples of Mississippian arrow points and Archaic and Woodland bifaces are shown in Figure 38. All small arrow points were considered Mississippian even though a few specimens resemble Late Woodland types. Mississippians were clearly selecting Burlington chert for arrow point production (ca. 50%, Table 27), while the next most popular cherts were Mill Creek (ca. 15%) and Blair/St. David (ca. 7%). Two of the Mill Creek points still possess traces of hoe polish, clearly illustrating they were manufactured from hoe flakes. Most of the Mississippian points are triangular with straight bases, although several convex based specimens were recovered. Five arrow points are side notched; three (Figure 38g-h) are similar to side-notched points recovered from Moorehead phase sites in the American Bottom (Milner et al. 1984:Plate 32), while the other two examples possess convex bases and more closely resemble Late Woodland Klunk points (Perino 1971:100).

Workmanship on arrow points varies from very poor to good, and length ranges from 2.2 cm to 3.8 cm except for one very unique specimen, a large heat-treated Mill Creek triangular point with slight damage on the base (Figure 38a). The point is 6.1 cm in length, 1.3 cm wide just above the damaged base, and 0.46 cm at its thickest point. Craftsmanship is excellent and approaches that exhibited in points recovered in Mound 72 at Cahokia (Fowler 1977). How or why this finely crafted point was deposited in a pit feature (feature 42) can only be left to conjecture.

Glacial chert was the most common material among the Archaic and Woodland bifaces (40%). One of the 10 bifaces cannot be assigned to an actual point type. It is only the bit end of a hafted scraper, but it is likely that the hafted scraper was Middle Archaic. Four side-notched Middle Archaic bifaces are present in the assemblage (Figure 38m-o), and three are hafted scrapers. The remaining point is a heavily resharpened Godar point, while the three hafted scrapers represent two Matanza points and another Godar (Cook 1976). It is likely that these bifaces are the only diagnostic residue that were deposited at the site by a Middle Archaic Helton phase occupation (ca. 3000-4000 B.C. [Cook 1976]). The occupation appears to have been quite ephemeral. One of the hafted scrapers (Figure 38n) was recovered from a Mississippian context--post mold 57 in Structural Complex 1.

Table 26. Frequency of Chipped Stone Tool Types.

Provenience Units	Functional Types: Bi-Face	*Gen. Cutting	*Gen. Scraping	*Adze Flake	Spoke-shave (Notch)	Den-ticu-late	*Graver	Macro Drill	Micro Drill	Chert Hammer	*Hoe Flake	Total
General Surface	28	42	66	13	3	3	3	-	-	1	22	181
Excavation Units	12	18	27	11	2	1	1	2	-	-	14	88
Structural Complex 1	11	9	19	11	-	1	-	-	-	1	4	56
Structural Complex 2	5	16	17	19	1	-	-	1	1	-	4	64
Pit Features												
#3	-	-	-	-	-	-	-	-	-	-	-	0
#6	-	1	-	-	-	-	-	-	-	-	-	1
#7	-	-	-	-	-	-	-	-	-	-	-	0
#42	3	5	1	5	-	1	-	1	-	-	2	18
#44	-	-	1	1	-	-	-	-	-	-	-	2
#47	1	-	-	-	-	-	-	-	-	-	-	1
#57	1	-	-	3	-	-	-	-	-	-	-	4
#75	-	4	2	-	-	-	-	-	-	-	1	7
#80	-	1	2	1	-	-	-	-	-	-	1	5
#81	-	-	2	-	-	-	-	-	-	-	-	2
#83	1	-	-	-	-	-	-	-	-	-	-	1
#91	3	2	1	3	-	-	-	-	-	-	-	9
#93	-	-	-	-	-	-	-	-	-	-	-	0
Total	65	98	138	67	6	6	4	4	1	2	48	439
Percent	14.8	22.3	31.4	15.2	1.4	1.4	0.9	0.9	0.2	0.4	11.0	99.9

*These categories represent number of functions, not number of individual items

Table 27. Chert Type Frequencies in Bifaces.

Cultural Affiliation	Chert Types (No./%)									
	Burlington	Glacial Till	Mill Creek	Blair/St. David	Kaolin	Cobden/ Dongola	Kinkaid	Ste. Genevieve	Indeter-minate	Total
Mississippian	14/51.8	1/3.7	4/14.8	2/7.4	0/0	0/0	0/0	1/3.7	5/18.5	27/99.9
Archaic/ Woodland	2/20.0	4/40.0	0/0	1/10.0	0/0	1/10.0	1/10.0	0/0	1/10.0	10/100.0
Indeterminate	4/14.3	1/3.6	2/7.1	4/14.3	1/3.6	5/17.8	1/3.6	0/0	10/35.7	28/100.0
Total	20/30.8	6/9.2	6/9.2	7/10.8	1/1.5	6/9.2	2/3.1	1/1.5	16/24.6	65/99.9

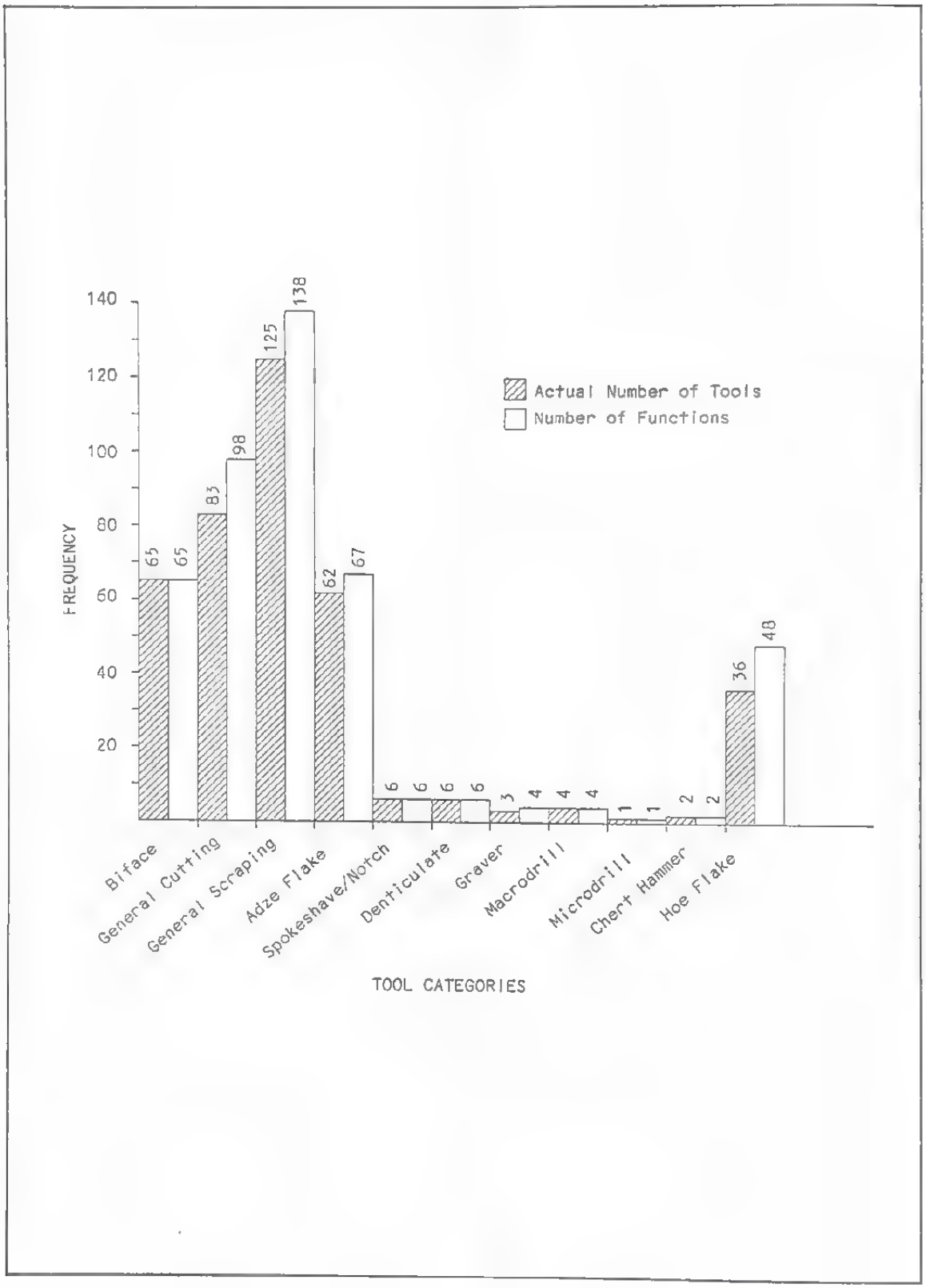


Figure 37. Chipped stone tool frequencies.

Figure 38. Bifaces

Mississippian

a. Triangular arrow point, Mill Creek chert, feature 42
b. Triangular arrow point, Burlington chert, mechanical stripping
c. Triangular arrow point, St. Genevieve chert, feature 91
d. Triangular arrow point, glacial till chert, mechanical stripping
e. Triangular arrow point manufactured on a polished flake, Mill Creek chert, mechanical stripping
f. Triangular arrow point, indeterminate, mechanical stripping
g. Notched arrow point, Burlington chert, mechanical stripping
h. Notched arrow point, indeterminate, mechanical stripping
i. Notched arrow point, Burlington chert, mechanical stripping

Archaic/Woodland

j. Archaic/Woodland projectile point, glacial till chert, feature 42
k. Late Woodland projectile point, Cobden/Dongola chert, feature 47
l. Archaic/Woodland projectile point, indeterminate, feature 91

Middle Archaic

m. Side-notched projectile point, Burlington chert, mechanical stripping
n. Hafted scraper, glacial till chert, Structural Complex 1
o. Hafted scraper, Blair/St. David chert, unit 45 plow zone

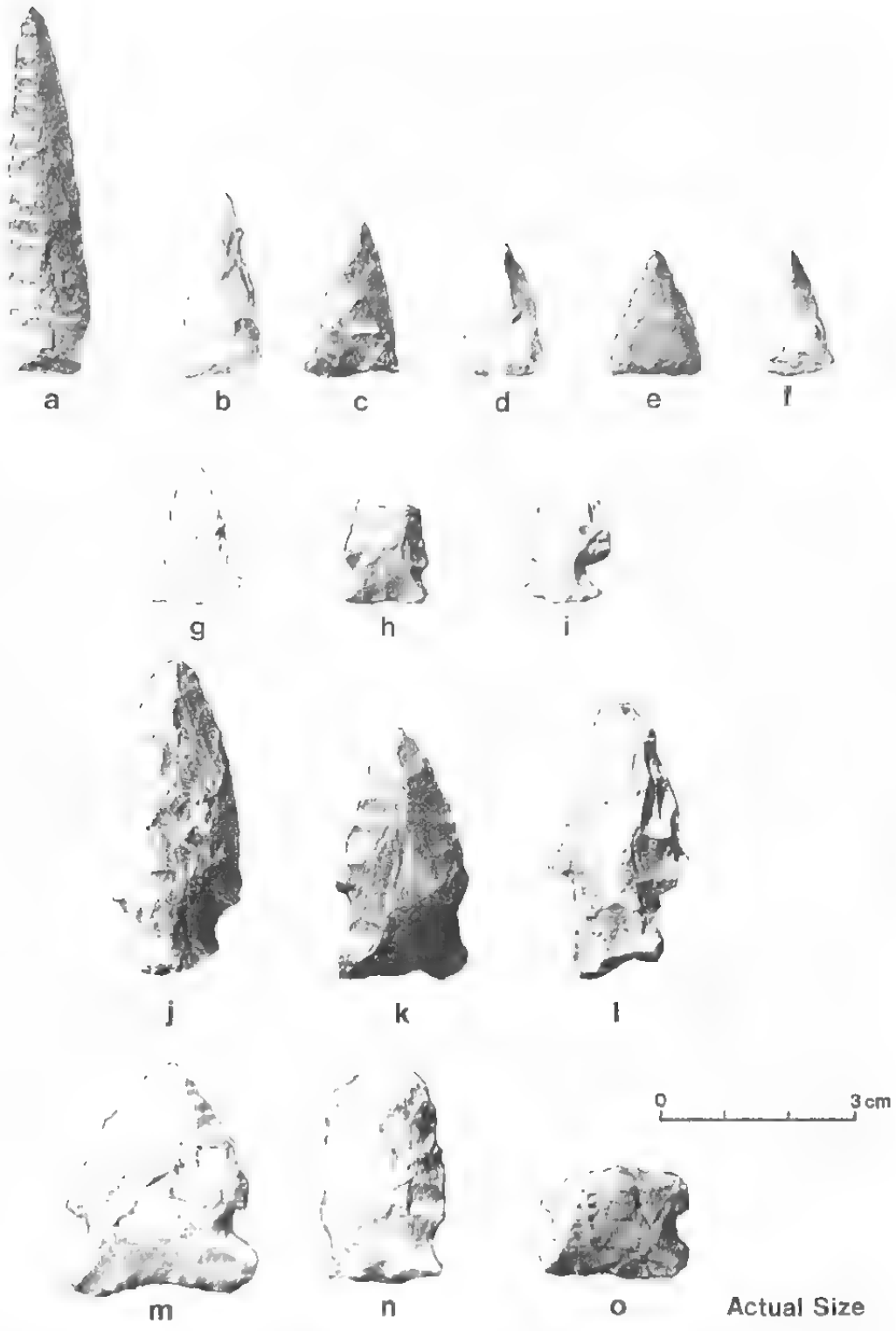


Figure 38. Bifacial artifacts.

Two of the remaining four bifaces are less diagnostic. One is a highly resharpened stemmed point; the other is similar to a Matanza (Figure 38j). Of the two remaining points, one is a resharpened Steuben/Lowe flared base point (May 1982); another is a resharpened Cypress Stemmed (May 1982; Trotter and McNerney 1984). It is likely that all or most of these bifaces could be early Late Wooodland. All but one were found in Mississippian features; it is likely that these bifaces were scavenged from the nearby (ca. 300 m) multicomponent Jamestown site (21C4-14) by Bonnie Creek site inhabitants for use as tools.

Generalized Cutting Tools (n=98). A total of 83 flake tools that functioned as generalized cutting tools was recorded, and an additional 15 multipurpose tools exhibited cutting edges. Consequently, a combined total of 98 tools was used to perform cutting tasks (Table 26, Figure 37). Cutting edges were identified on core reduction flakes, biface reduction flakes, and block shatter.

Generalized Scraping Tools (n=138). One hundred twenty five flake tools functioned as generalized scraping tools, and an additional 13 multipurpose tools exhibited scraping edges. Consequently, a combined total of 138 tools was used to perform scraping tasks (Table 26, Figure 37). Scraping edges commonly appeared on block shatter, core reduction flakes, and biface reduction flakes. Most scraping tools in the assemblage were simply flakes used with little or no prior modification; however, 18 formalized scrapers were identified. They possessed at least two uniformly retouched edges. The tools could be described as side scrapers and combination end and side scrapers. Several of these tools possessed heavily rounded and polished edges, and one may have been hafted (Figure 39). Chert types used in the manufacture of the formalized scrapers include Burlington (n=8, 44%), Mill Creek (n=5, 28%), Kaolin (n=2, 11%), Blair/St. David (n=2, 11%), and Cobden (n=1, 6%).

Adze Flakes and Fragments (n=67). Sixty two adze resharpening flakes and fragments were recovered, and an additional four flakes and one fragment were utilized. The flakes were used as cutting and/or scraping tools, while the fragment was converted into a bipolar core. Taken as a whole, 67 pieces of debitage with wood polish were recovered from the site. However, one small fire damaged fragment of a highly polished (i.e., no flake scars evident) chert tool may represent a fragment of chert spud (e.g., Titterington 1938:Fig. 23). Also, a small fragment of a Mill Creek pick (e.g, Titterington 1938:Fig. 22) was identified. Chert types represented are Burlington (n=46, 68%), indeterminate (n=10, 15%), Mill Creek (n=5, 7%), Kaolin (n=5, 7%), and Blair/St. David (n=1, 2%).

Spokeshaves/Notches (n=6). Six spokeshaves were identified, and all occurred on pieces of debitage.

Denticulates (n=6). Six denticulated edges were identified, and all occurred on pieces of debitage.

Figure 39. Formalized Scrapers

a. Cobden/Dongola chert, feature 42

b. Mill Creek chert, mechanical stripping

c. Burlington chert, Structural Complex 1

d. Kaolin chert, Structural Complex 2

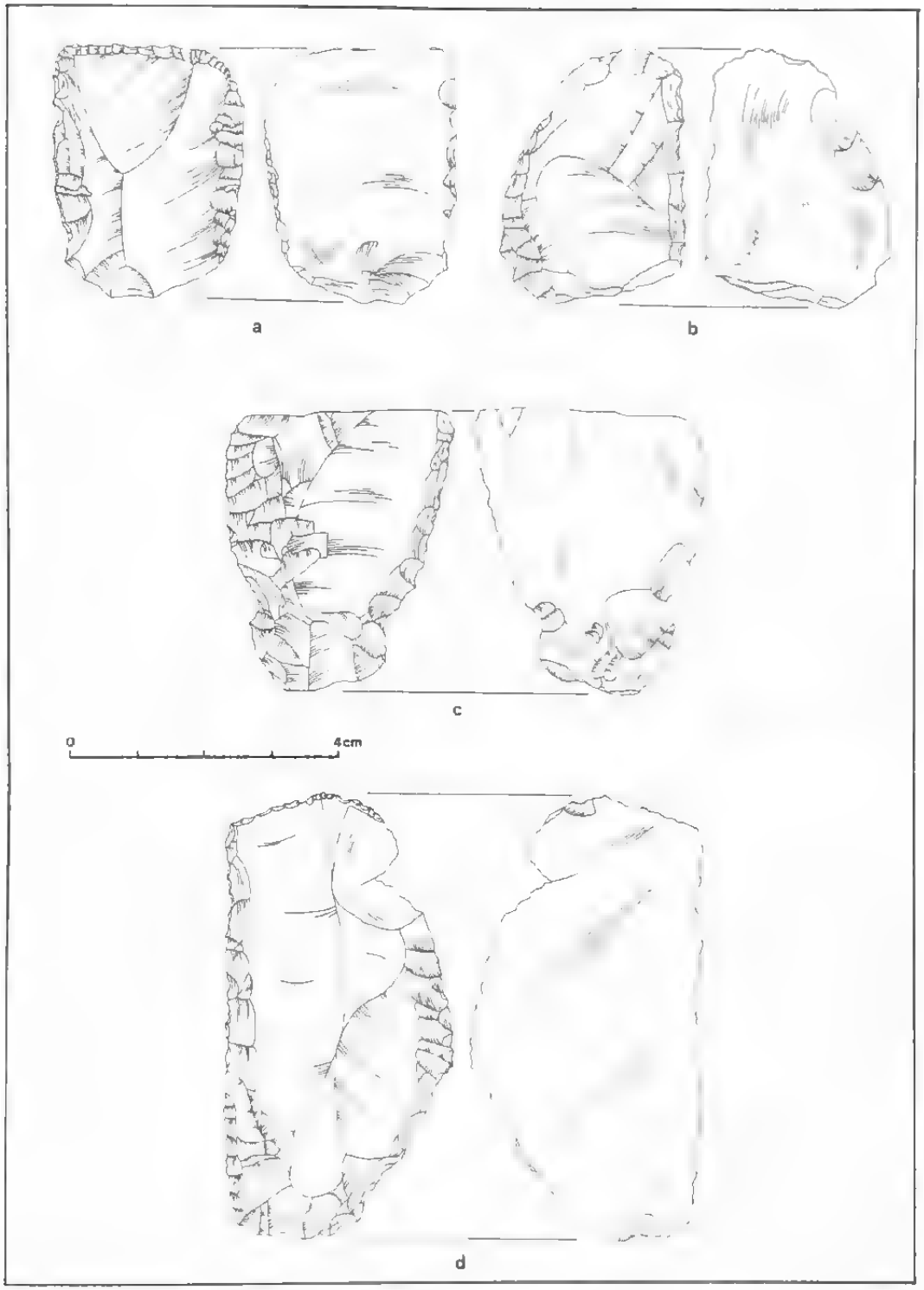


Figure 39. Formalized scrapers.

Gravers (n=4). Four graver points were identified. Three occurred on flakes with no other functional edges, and one occurred on a multipurpose tool.

Macrodrill (n=4). Four drills were recovered. All were fragmentary, but it was evident that they once measured at least 3-4 cm in length. Two were recovered in mixed contexts, and two were found in Mississippian features (Table 26). It is likely that these tools were Mississippian.

Microdrill (n=1). One microdrill was recovered from a wall trench (feature 64) in Structural Complex 1. It is manufactured from Burlington chert, has been fire damaged, and is 3.5 cm long and 0.6 cm thick (Figure 40g). It is identical to larger specimens of the Cahokia microlith industry (cf. Mason and Perino 1961; Yerkes 1983).

Chert Hammers (n=2). Two specimens were recovered; one fragmentary specimen was found during mechanical stripping. The other is intact and was found within Structural Complex 2.

Hoe Flakes and Fragments (n=48). Thirty eight hoe flakes and one fragment were recovered that had not been utilized, and many of the other tools and pieces of debitage made of Mill Creek chert that did not possess traces of hoe polish were likely detached from hoes as well. Twelve hoe flakes and fragments were converted into a variety of tools: arrow points, cores, flake tools, and formalized scrapers. Taken as a whole, 48 flakes and small fragments of hoes were identified; chert types include Mill Creek (n=47, 98%) and Kaolin (n=1, 2%).

Chipped Stone Debitage

Freehand Cores (n=15). Freehand percussion cores are pieces of chert that have had flakes detached in multiple directions by holding the core in one hand and striking it with a hammerstone held in the other hand (Crabtree 1972). Freehand core reduction produces flake shatter, block shatter, decortication flakes, and core reduction flakes. Fifteen freehand cores with a mean weight of 47.2 g (Tables 28 and 29; Figure 41) were identified. A wide assortment of cherts was converted into freehand cores, but Blair/St. David and glacial cherts were the most commonly used. Mill Creek hoe fragments were also converted into freehand cores.

Bipolar Cores (n=41). Bipolar cores are pieces of chert that have been placed on an anvil and struck vertically with a hammerstone (Binford and Quimby 1963; Crabtree 1972; Hayden 1980). The objective of this flaking technique is to detach flakes from small pieces of chert; however, large quantities of shatter usually are produced as well. Flakes detached from bipolar cores often have sheared bulbs of percussion, shattered striking platforms, and crushing on one or both ends. Bipolar cores generally assume a tabular shape and possess heavy crushing and battering on both poles or ends. There has been confusion over distinguishing wedges (Pieces Esquillees) from bipolar cores. All specimens from the Bonnie Creek site appear to be bipolar cores.

Figure 40. Microliths

a. Core, Burlington chert, mechanical stripping

b. Core, Burlington chert, mechanical stripping

c. Core, Burlington chert, mechanical stripping

d. Core, Mill Creek chert, mechanical stripping

e. Blade, Burlington chert, mechanical stripping

f. Blade, Mill Creek chert, Structural Complex 2

g. Drill, Burlington chert, Structural Complex 2

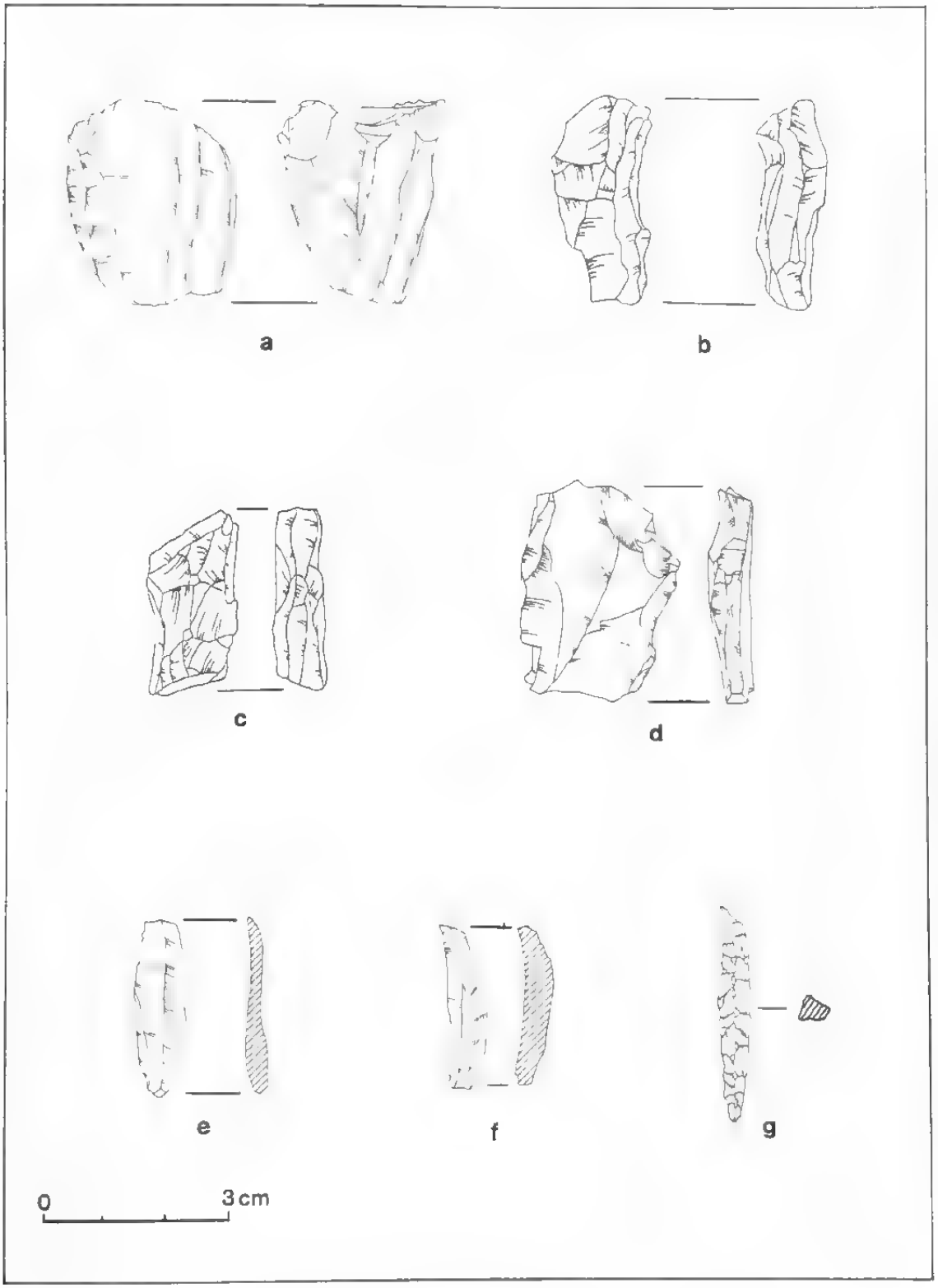


Figure 40. Microliths.

Table 28. Chipped Stone Debitage Frequencies.

Provenience Units	Freehand Core	Bipolar Core	Microlith Core	Decortication Flake	Block Shatter	Flake Shatter	Micro Blade	Core Reduction Flake	Biface Reduction Flake	Flake Fragment	Total
General Surface	11	19	5	10	56	20	2	56	25	42	246
Excavation Units	2	6	-	12	42	18	1	37	20	29	167
Structural Complex 1	-	3	-	8	10	31	-	14	24	19	109
Structural Complex 2	1	5	-	3	27	8	1	14	9	12	80
Pit Features											
#3	-	-	-	-	-	-	-	-	1	1	2
#6	-	-	-	-	-	-	-	-	-	-	0
#7	-	-	-	-	-	3	-	-	-	1	4
#42	-	1	-	1	1	6	-	1	3	6	19
#44	-	-	-	-	2	2	-	-	-	-	4
#47	-	1	-	-	1	1	-	3	-	2	8
#57	-	2	-	-	1	-	-	-	2	1	6
#75	-	1	-	-	1	-	-	-	-	-	2
#80	-	2	-	-	1	-	-	2	1	-	6
#81	-	-	-	-	-	-	-	-	1	1	2
#83	-	-	-	-	-	3	-	-	-	-	3
#91	1	-	-	1	-	-	-	-	1	1	4
#93	-	1	-	-	-	-	-	-	-	-	1
Total	15	41	5	35	142	92	4	127	87	115	663
Percent	2.3	6.2	0.7	5.3	21.4	14.0	0.6	19.1	13.1	17.3	100

Table 29. Core Types.

Chert Types	Core Types				
	Freehand Cores				
	No.	Wt.(g)	Mean Wt.(g)	% No.	% Wt.
Glacial Till	3	395.7	131.9	20.0	55.8
Burlington	1	12.3	12.3	6.7	1.7
Mill Creek	2	71.6	35.8	13.3	10.1
Blair/St. David	4	169.5	42.4	26.7	24.0
Cobden/Dongola	2	23.9	11.9	13.3	3.4
Indeterminate	3	35.7	11.9	20.0	5.0
Total	15	708.7	47.2	100.0	100.0
	Bipolar Cores				
Glacial Till	9	53.3	6.2	22.0	25.0
Burlington	14	67.2	4.8	34.1	31.5
Mill Creek	3	14.8	4.9	7.3	7.0
Blair/St. David	1	3.0	3.0	2.4	1.4
Kaolin	1	3.0	3.0	2.4	1.4
Indeterminate	13	72.0	5.5	31.7	33.7
Total	41	213.3	5.2	100.0	100.0
	Microlith Cores				
Burlington	3	37.0	12.3	60.0	67.0
Mill Creek	2	18.3	9.2	40.0	33.0
Total	5	55.3	11.1	100.0	100.0

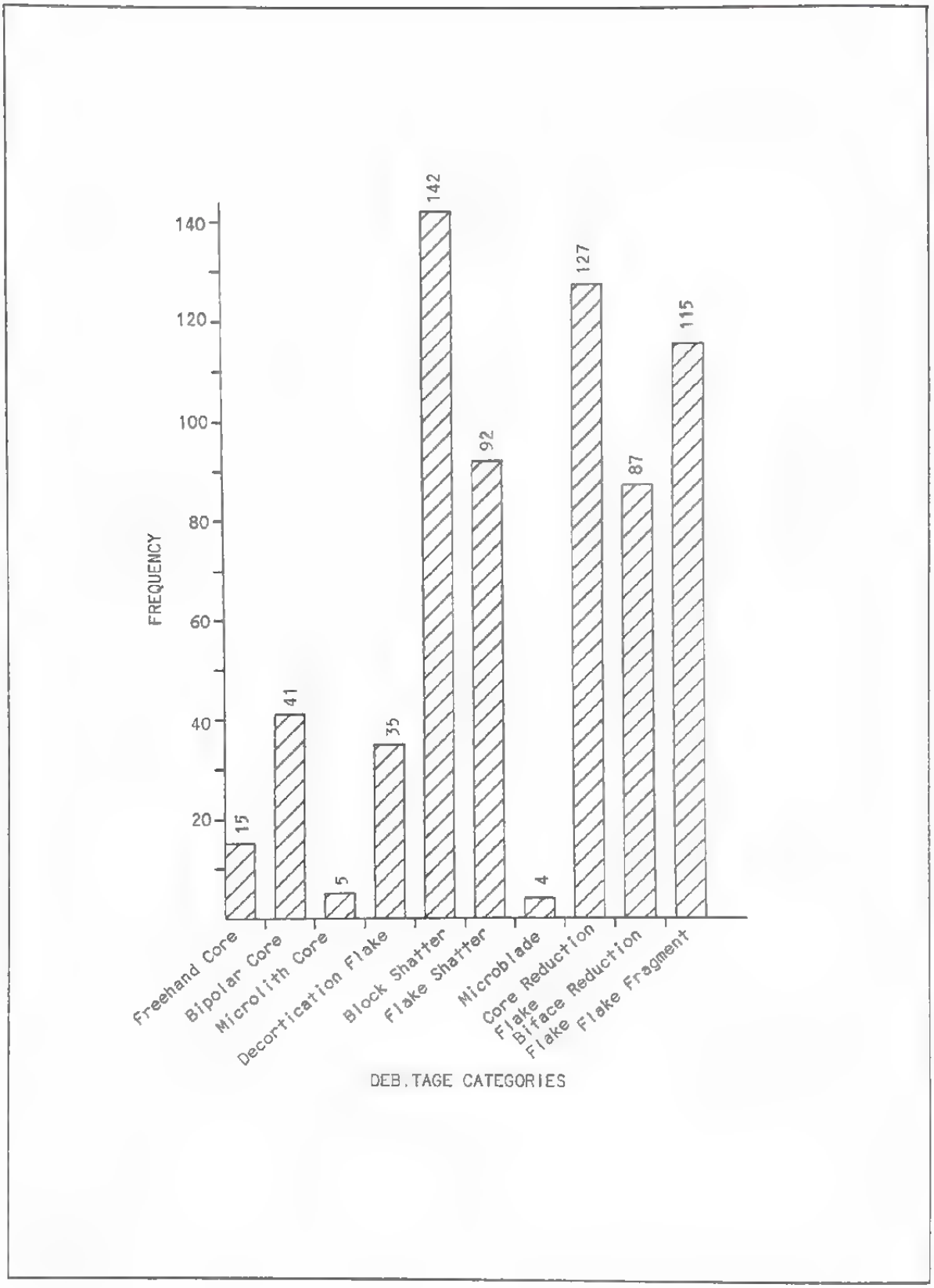


Figure 41. Chipped stone tool debitage frequencies.

A total of 41 bipolar cores was identified (Table 29) as well as numerous bipolar flakes (Figure 41). The mean weight of bipolar cores was 5.2 g, and the dominant cherts employed were Burlington and glacial till (Table 29). It is noteworthy that at least one of the Mill Creek bipolar cores possessed hoe polish.

Microlith Cores (n=5). Five microlith cores were recovered that are identical to cores of the Cahokia microlith industry (cf. Mason and Perino 1961; Yerkes 1983). Their mean weight is 11.1 g. Three were manufactured from Burlington chert, and two were converted Mill Creek hoe parts (Figure 40a-d). Also, the flake scars on one of the Burlington cores indicate that it may have been an Archaic or Woodland biface prior to conversion into a microlith core (Figure 40c). All three of the Burlington cores are basically columnar in shape, while the two Mill Creek examples are tabular and have only had microblades detached longitudinally down their edges.

Decortication Flakes (n=35). Thirty five decortication flakes were recovered that had not been converted into tools (Table 28). An assortment of cherts are represented: glacial (n=21, 60%), indeterminate (n=4, 11%), Burlington (n=2, 6%), Kaolin (n=2, 6%), Blair/St. David (n=3, 8%), and Cobden (n=3, 8%).

Block Shatter (n=142). A total of 142 pieces of block shatter was recovered (Table 28).

Flake Shatter (n=92). A total of 92 pieces of flake shatter was recovered (Table 28).

Microblades (n=4). Four microblades were identified that compare favorably to those of the Cahokia microlith industry (Figure 40e-f). Three are made of Burlington chert, and one is Mill Creek. Only the Mill Creek specimen (Figure 40f) was recovered from a Mississippian feature (Structural Complex 2).

Core Reduction Flakes (n=127). A total of 127 flakes detached from freehand and bipolar cores that were not converted into flake tools was recovered.

Biface Reduction Flakes (n=87). A total of 87 biface thinning and resharpening flakes that were not converted into flake tools was identified (Table 28; Figure 41). These flakes were detached from Archaic and Woodland bifaces and Mississippian large bifaces, but the latter did not possess hoe or wood polish.

Flake Fragments (n=115). A total of 115 flake fragments that were not utilized and could not be placed in one of the above flake categories was identified.

Groundstone Tools and Cracked Rock

A total of 27,984 g of groundstone and cracked rock was recovered from the Bonnie Creek site (Tables 30 and 31). The 79 groundstone tools

Table 30. Groundstone Tool Frequencies.

Provenience	Functional Types									
	Mano	Metate	Hammer	Anvil	*Celt	Pitted Stone	Slotted Abrader	Flat Abrader	Sandstone Saw	Total
General Surface	18	1	11	5	-	1	-	-	-	36
Excavation Units	5	-	2	3	-	-	2	-	-	12
Structural Complex 1	11	-	8	11	2	3	6	6	-	47
Structural Complex 2	12	1	6	6	-	2	5	5	2	39
Pit Features										
#42	-	-	-	-	-	-	2	-	-	2
#49	2	-	1	2	-	-	-	-	-	5
#57	-	2	-	-	-	-	-	1	-	3
#80	3	3	3	1	-	-	-	-	-	10
#81	2	-	1	1	-	-	-	-	-	4
Total	53	7	32	29	2	6	15	12	2	158
Percent	33.5	4.4	20.2	18.3	1.3	3.8	9.5	7.6	1.3	99.9

*All functional categories, excluding celts, are quantified by number of functional surfaces, not individual items.

Table 31. Cracked Rock Frequencies.

Provenience Unit	Types of Raw Material* Limestone	Sandstone	I/M	Limonite	Total
Excavation Units	1062.0	3235.0	1874.0	155.0	6326.0
Structural Complex 1	117.0	312.0	126.0	47.0	602.0
Structural Complex 2	19.0	563.0	3101.0	200.0	3883.0
Pit Features					
#3	-	3.0	-	-	3.0
#6	-	-	10.0	-	10.0
#30	-	29.0	60.0	-	89.0
#42	-	296.0	65.0	3.0	364.0
#44	36.0	-	2.0	-	38.0
#47	-	2.0	140.0	-	142.0
#57	-	4.0	3.0	1.0	8.0
#69	128.0	390.0	80.0	-	598.0
#75	72.0	167.0	-	40.0	279.0
#80	474.0	28.0	80.0	-	582.0
#81	8.0	-	-	12.0	20.0
#83	-	25.0	-	2.0	27.0
#91	876.0	30.0	78.0	5.0	989.0
Total	2792.0	5084.0	5619.0	465.0	13960.0
Percent	20.0	36.4	40.3	3.3	100

* weighed to the nearest 1.0 g

had a combined weight of 14,024 g, while the 634 pieces of cracked rock weighed 13,960 g. The latter is divided into four rock types: limestone, sandstone, igneous/metamorphic, and limonite (Table 31). By weight, igneous/metamorphic is the most common (40%). Much of the limonite category is not actually composed of limonite but small fragments of ferruginous sandstone. Cracked rock is interpreted as residue from food processing and preparation (Table 31). Only certain features contained high frequencies of this lithic residue, e.g., Structural Complex 2 and pit features 42, 69, 75, and 91.

Mano/Grinding Stones (n=53). A total of 53 grinding surfaces was recorded on igneous/metamorphic cobbles. High concentrations were found in the structures and mechanical stripping sample (Table 30).

Metate/Grinding Slabs (n=7). Seven large grinding surfaces or fragments thereof were identified. These occurred on large igneous/metamorphic cobbles, slabs of sandstone, and on one limestone slab. Feature 80 contained the largest number (Table 30).

Hammers (n=32). Evidence of hammering activities existed on 32 igneous/metamorphic cobbles.

Anvils (n=29). Twenty nine shallow anvil depressions were identified on igneous/metamorphic cobbles. The largest numbers of anvils occurred in the structural complexes (Table 30).

Celts (n=2). Two intact celts (Figure 42) were recovered in or directly adjacent to Structural Complex 1. The smallest specimen may have functioned as an adze. Its bit is slightly tilted to one direction, with the opposite face of the bit exhibiting the most wear.

Pitted Stone (n=6). A total of only six pits occurred on all the cobble tools.

Slotted Abraders (n=15). A total of 15 abrader slots occurred on six fragments of sandstone (Figure 42b). Most of the slotted abraders were recovered from the structures (Table 30).

Flat Abraders (n=12). Twelve flat to slightly concave abrading surfaces occurred on 10 tabular pieces of sandstone. One very thin, tabular piece from feature 12 in Structural Complex 1 had hematite/limonite residue on both faces.

Sandstone Saws (n=2). One finely worked piece of sandstone was recovered from Structural Complex 2 (Figure 42d). The specimen had two acute linear edges that may have functioned as sawing edges to sever or abrade resistant materials. This artifact is similar to those illustrated from Cahokia by Titterington (1938:Figure 25). An additional sandstone saw was recovered from Structural Complex 1 but was misplaced and not located until analysis had been completed.

Large Biface Industry

Evidence of a large biface industry at the Bonnie Creek site is represented by numerous hoe and adze resharpening flakes and a few small fragments. Complete or nearly complete specimens were not recovered but probably would have been similar to those illustrated by Titterington (1938:Figs. 17, 18, 21). The lack of complete hoe and adze blades is explained by the fact that these large bifaces would have been highly prized pieces of equipment in the chert poor till plains of southern Illinois. Not only were these large bifaces used to till soil and cut and work wood, but they also could be converted or recycled into a wide variety of tools.

The Mississippian production of large bifaces, i.e., hoes, adzes, picks, Ramey knives, etc., was centered around the Mill Creek, Kaolin, and Crescent Hills source areas (Figure 35) (Koldehoff 1986b). These large tools were designed for specific functions and were possibly manufactured by part-time specialists at or near the source areas. Available evidence indicates that these tools were widely distributed in finished form. Further details on the production and distribution of

Figure 42. Groundstone Tools

a. Celt, Structural Complex 1

b. Sandstone slotted abrader, Structural Complex 2

c. Celt, stripped surface near Structural Complex 1

d. Sandstone saw, Structural Complex 2

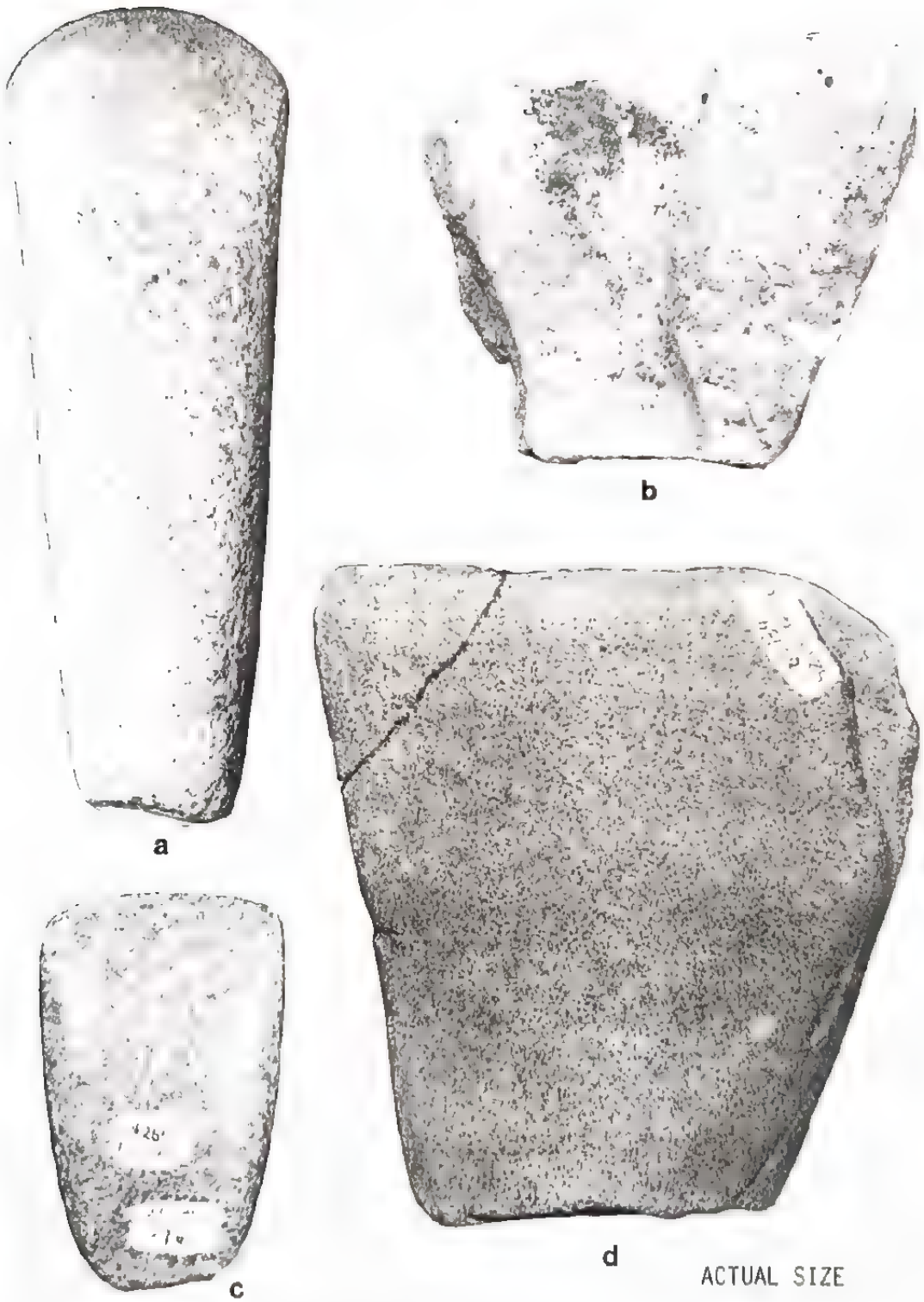


Figure 42. Groundstone tools.

large bifaces can be found in Cobb (1985), Koldehoff (1985a), May (1984), and Winters (1981).

At the Bonnie Creek site, several Mill Creek chert hoes were resharpened, and recycled Burlington, Mill Creek, and Kaolin adzes were resharpened and recycled as well. Also present was at least one Mill Creek pick and possibly a Ramey knife. Careful examination of these artifacts has resulted in the reconstruction of a generalized trajectory of maintenance and recycling for hoes. The process of chipped stone adze recycling and maintenance is similar to that of the hoes, but only the hoe trajectory will be outlined as a greater number of tools and debitage manufactured from these artifacts have been identified (Figure 43).

Debitage analysis indicates that Mill Creek hoe blades and Burlington, Kaolin, and Mill Creek adze blades were arriving at the Bonnie Creek site as finished tools. Hoe blades would have been hafted onto wooden handles (e.g., Birger Figurine, Milner et al. 1984:Figure 31). With use, hoe blades dulled and were resharpened by detaching flakes from the bit. These flakes were discarded or converted into a variety of tools: arrow points, flake tools, bipolar cores, and microliths (Figure 43). If the hoe blade was broken, its parts were converted into tools as well, particularly cores. Along any point in the trajectory, the hoe could be lost away from the site, or it could be curated by the Bonnie Creek site inhabitants when they abandoned the site, thus leaving no intact hoe blades at the site. If the hoe was not broken or removed, it is hypothesized that it would continue to function as a hoe blade until its size was greatly reduced. At this point, it could have been converted into smaller bifacial tools (e.g., adze or Ramey knife), or it may have simply served as a core. At other Mississippian sites, hoes were also converted into chert hammers and choppers (Koldehoff 1985a).

Flake Tool Industry

The majority of the tools recovered from the Bonnie Creek site were simple flake tools that were detached from unprepared cores and used to perform a wide variety of tasks with little to no modification. This technology is nearly identical to the Cahokia flake tool industry described recently for the American Bottom (Koldehoff 1985a, 1986b).

The flake tool industry at the Bonnie Creek site is an example of an expedient tool technology. Flakes were simply struck from freehand or bipolar cores and used as tools. Little effort was expended to modify (or formalize) the working edge of the flake prior to use. Furthermore, these flake tools do not appear to have been highly maintained or subjected to long periods of reuse in contrast to formalized tools such as hoes and adzes. A large number of household tasks including generalized and specialized cutting, scraping, and shredding and engraving were carried out with flake tools. By function (Table 26), greater than 50% of the tasks at the site (Tables 26 and 28) were performed with expedient flake tools.

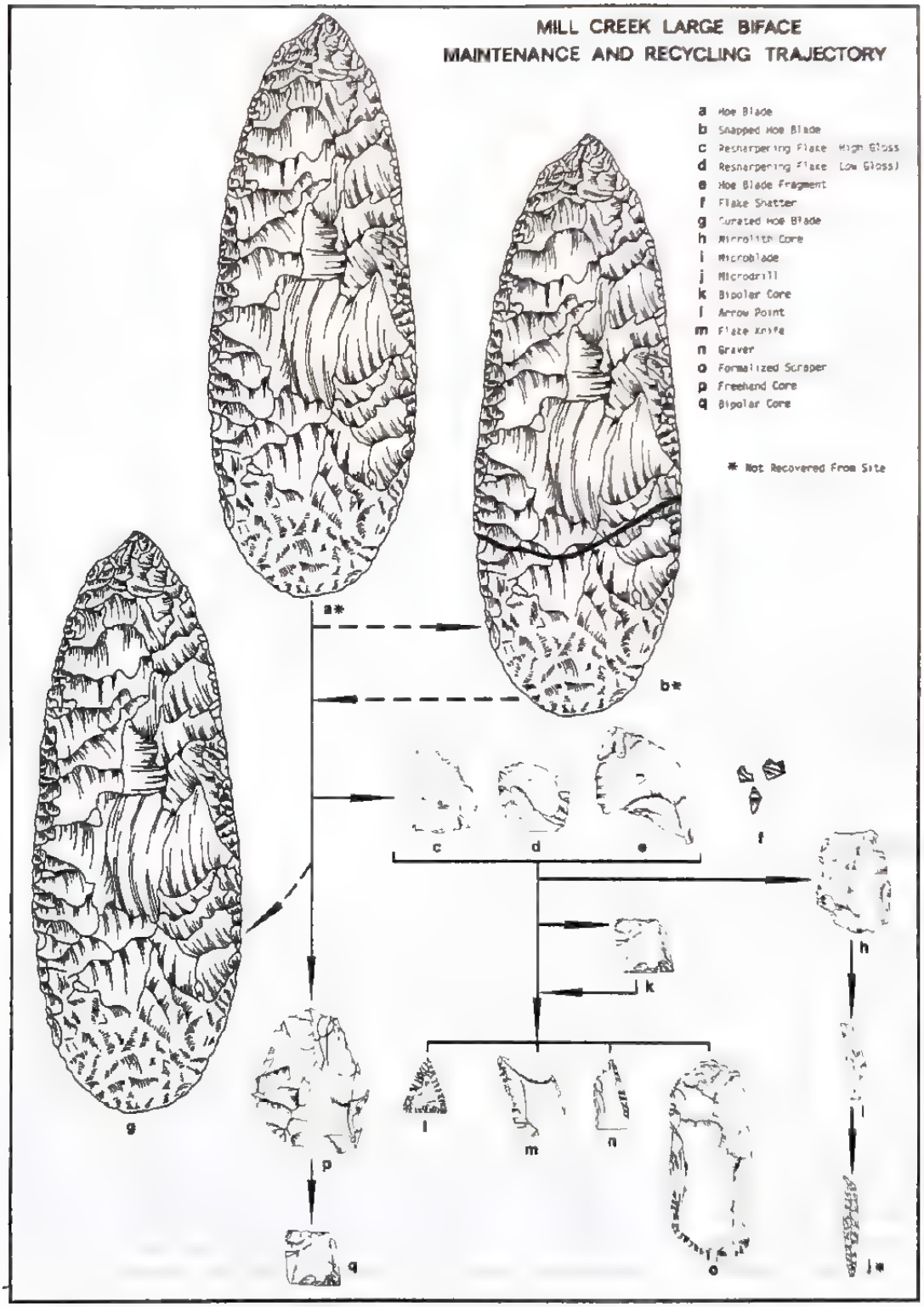


Figure 43. Mill Creek large biface maintenance and recycling trajectory.

Debitage and flake tool analysis indicates that an assortment of cherts was employed in flake tool production. The most popular were Burlington, glacial till, and Blair/St. David. The technology employed in recycling hoe and adze blades into flake tools was clearly part of the overall production strategy for expedient flake tools at Bonnie Creek.

Glacial cobbles were reduced into flakes by freehand percussion or the bipolar method depending on the size of the cobble. Burlington and Blair/St. David cherts appear to have arrived at the site as large, blocky cores with minimal cortex present. These blocky cores were reduced by freehand percussion, and once they became too small to be hand held, they were placed on anvils and reduced by the bipolar method. The Burlington and Blair/St. David production trajectories are similar, but Burlington chert was used to perform a wider variety of tasks (Figure 44).

It is likely that large (ca. 400-2,000 g) blocky cores of Burlington (Crescent Hills) chert, similar to those recovered in caches in the American Bottom (Koldehoff 1986b; Milner and Williams 1984: Plate 5, Figure 32), were obtained by the residents of the Bonnie Creek site. These large cores were reduced into a wide assortment of tools (Figure 44), both formalized (e.g., arrow points, microliths, end and side scrapers) and expedient or nonformalized (e.g., flake knives and scrapers, spokeshaves, and denticulates). Similar to Mill Creek hoes, Burlington chert probably was a prized commodity, for it was reduced to very small pieces. Only one freehand core weighing 12.3 g was recovered, while 14 bipolar cores with a mean weight of only 4.8 g were recovered.

Microlith Industry

A microlith industry at the Bonnie Creek site is represented by five cores, four blades, and one drill (Figure 40). The technology is identical to that of the Cahokia microlith (or microdrill) industry (Mason and Perino 1961; Yerkes 1983). Microdrills were apparently specialized drills designed primarily to drill shell beads (Yerkes 1983). Their production involved a special set of procedures contrasting greatly with those employed in biface production and maintenance and flake tool production. Yerkes (1983) and Koldehoff (1985a, 1986b) provide the most recent overviews of Cahokia microlith production and use. Microlith production at the Bonnie Creek site was a specialized "secondary" industry which utilized materials generated during hoe maintenance and recycling and Burlington chert flake tool production (Figures 43 and 44). It is difficult to assess the function of the microliths at the Bonnie Creek site as shell beads or scraps of marine shell were not recovered, possibly due to poor preservation.

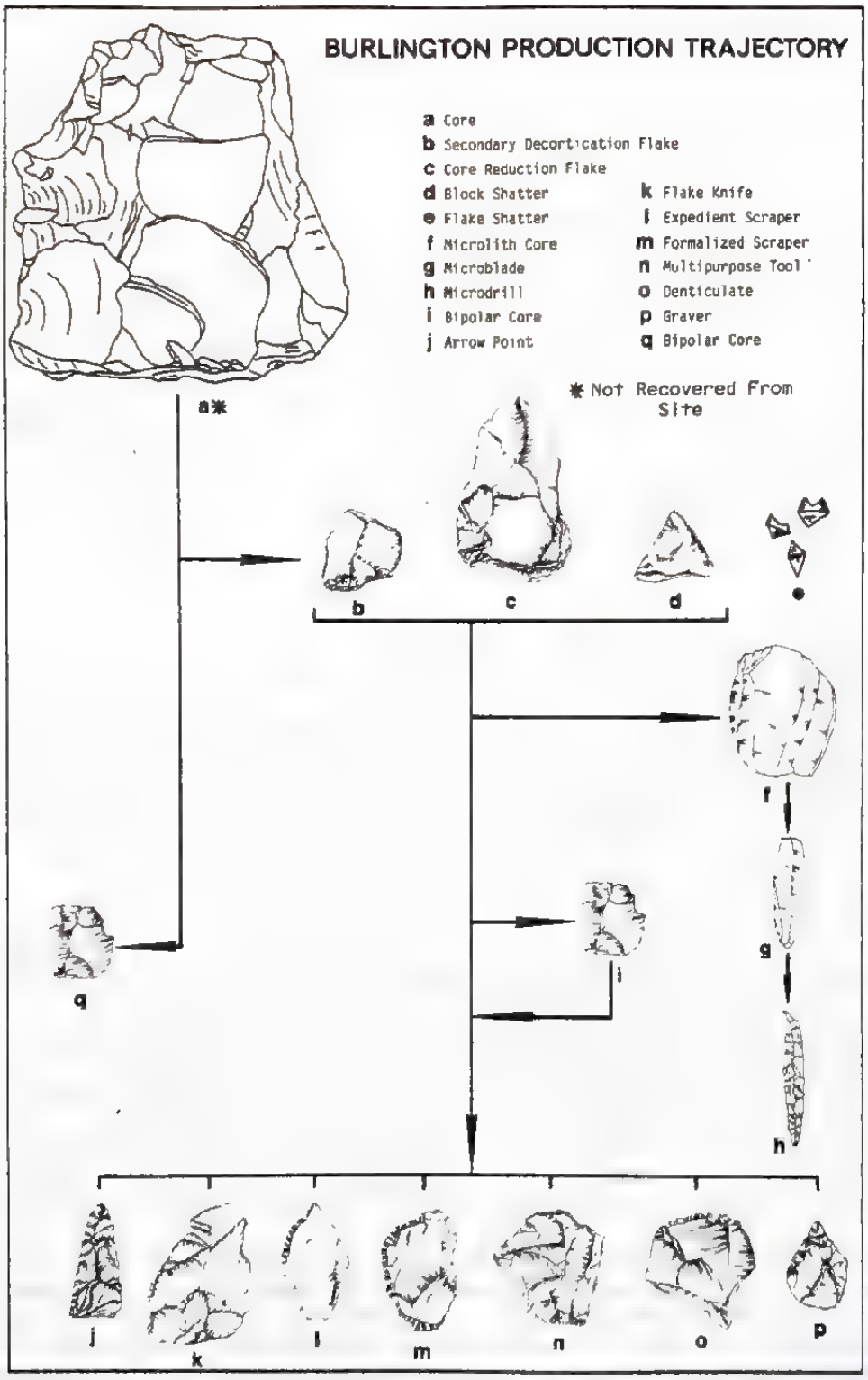


Figure 44. Burlington production trajectory.

Groundstone Tool Industry

This industry is poorly represented at the Bonnie Creek site. Only four formalized groundstone tools were recovered: two igneous/metamorphic celts and two sandstone saws (Figure 42). However, groundstone technology is limited in most Mississippian assemblages.

Most groundstone tools at the Bonnie Creek site were simple modified igneous/metamorphic cobbles and chunks or slabs of sandstone. These tools were often expedient in production and use, and the technology involved was simple. The principal task was collecting cobbles or slabs of the appropriate size and shape. The formalized tools like celts were manufactured by pecking and grinding igneous/metamorphic glacial cobbles into a desired shape. This procedure could be time consuming and employed chert hammers and flat surface abraders. Formalized groundstone tools not represented in the Bonnie Creek site assemblage are discoidals and pipes. This is understandable, for these artifacts are not common in habitation refuse.

Discussion

The Mississippian chipped stone technology at the Bonnie Creek site can be separated into two production and maintenance strategies--formalized and nonformalized or expedient. The large biface and microlith industries manufactured highly formalized tools designed for special functions which, in the case of large bifaces, could be maintained and reused for an extended period of time. In contrast, the flake tool industry manufactured simple tools that could be used to perform a variety of tasks and were not regularly maintained and reused.

Expedient flake tools were the most commonly produced and used tools at Bonnie Creek. Many daily household production and maintenance tasks would have employed these simple tools. Glacial cobbles, Burlington cores, Blair/St. David cores, and large fragments of hoe and adze blades represented flexible tool kits for an assortment of flake shapes and sizes could be detached to perform a variety of tasks. Cores and cobbles would not have been highly portable but were very flexible. Thus, expedient flake tool technology was a well-suited strategy for sedentary populations (Koldehoff 1986b; Parry and Kelly 1986). In terms of resource scarcity, it would have been more efficient; a larger number of tools (i.e., more cutting and scraping edges) could have been derived from one block of chert as compared to a bifacial tool strategy.

In addition to large bifaces and microliths, end/side scrapers (Figure 39) and scavenged Archaic and Woodland bifaces were the only other formalized chipped stone tools in the site assemblage. The fairly large number of biface thinning and resharpening flakes (n=83, 13% of debitage) recovered from the site can be attributed to the maintenance and recycling of Archaic and Woodland bifaces and Mississippian hoe and adze blades. When a hoe or adze blade was resharpened or converted into a core, only the first series of flakes that were detached would exhibit traces of use polish.

In sum, the Mississippian chipped stone technology at the Bonnie Creek site was organized to effectively respond to the demands of a sedentary lifestyle in the till plains of southern Illinois in which horticulture and scant lithic resources were important factors.

Site Activities

A total of 393 chipped stone tools, 663 pieces of debitage, 79 groundstone tools, and 634 pieces of cracked rock was recovered from the Bonnie Creek site. The previous two sections have addressed lithic procurement and production, while this section summarizes site activities.

Reconstructing site activities is hindered by differential preservation of raw materials. Stone is durable while other materials are not. Thus, partial evidence for some activities is preserved in the archaeological record, while other activities may not be represented at all. A variety of site formation processes can greatly affect what is deposited and recovered from a site (Binford 1983; Schiffer 1976).

Artifacts were assigned to specific functional categories on the basis of morphology and use wear. The context in which artifacts are recovered can also provide information about function and possibly enable tool kits and activity areas to be delineated; however, the nature of the associations and spatial patterning is critical. Intact living surfaces (e.g., house floors) were not identified at the Bonnie Creek site. Furthermore, temporal separation of the lithic tools and debris from the various Mississippian occupations is difficult. Consequently, the lithic assemblage will be examined as a single unit, and brief comments will be made concerning the Middle Archaic component.

Middle Archaic

Artifacts that can be assigned to the Middle Archaic (Helton phase) component are two Godar points and two Matanza points. One Godar is heavily resharpened, while the three remaining points were converted into hafted scrapers (Figure 38n-o). The bit of another hafted scraper was also recovered, and another biface from the site is very similar to a Matanza (Figure 38m). The four definite Middle Archaic bifaces were manufactured from Burlington, glacial till (n=2), and Blair; all are heat treated except one glacial till specimen. The quantity of nondiagnostic lithic materials (e.g., biface distal tips, debitage, cracked rock, manos, etc.) that can be attributed to the Middle Archaic component cannot be determined. It is unlikely that all four bifaces were deposited at the site by Mississippians scavenging Archaic sites, for only one of the four was found in a Mississippian feature.

Likely activities represented by the four bifaces are hunting, butchering, and hide working. The latter activity is evidenced by polish and rounding of the bits on the hafted scrapers. Like many of the ridge tops in the Galum Creek drainage, the Bonnie Creek site

location was ephemerally utilized during the Middle Archaic period, perhaps as a seasonal hunting and/or hide processing camp.

Mississippian

Structural remains from the site clearly indicate the Bonnie Creek site was a Mississippian habitation site occupied for an extended period of time or reoccupied on several occasions. The functional analysis of lithic tools was conducted in a manner that allowed the total number of tasks performed with each tool to be recorded (393 chipped stone tools = 439 total functions; 79 groundstone tools = 158 total functions). This provided a measurement of site activities. For purposes of interpretation, tools and debris were placed into one of seven activity units: (1) stone tool production and maintenance, (2) processing and preparation of foodstuffs, (3) hunting, (4) cultivating/excavating, (5) woodworking, (6) general production and maintenance, and (7) miscellaneous. Admittedly, many tool types could be placed in several of these activity units; however, tool types were placed only in the activity to which they were apparently most directly related. The Bonnie Creek site was a habitation site occupied for an extended period of time; thus, a large number of activities should be represented with domestic activities being the most common (i.e., activity units 2 and 6). In addition, any activity or activities that represent a significant portion of the assemblage may represent a site specialization, a particular adaptive strategy, or a seasonal occupation.

Stone Tool Production and Maintenance. All tools and debris that could be directly tied to chipped stone and groundstone tool production and maintenance and could not be directly assigned to other activities were placed in this category. These include freehand and bipolar cores, anvils, chert hammers, and all flakes and shatter except microblades (Tables 28-29, 31). Hoe and adze fragments and resharpening flakes are not included here as they provide the only evidence for hoe and adze blades, which were highly curated and frequently recycled.

Processing and Preparation of Foodstuffs. The tools and debris that most directly relate to processing and preparation of various foodstuffs are manos, metates, pitted stones, and cracked rock (Tables 30-31). The most common material worked with these tools would have been plant foods, e.g., maize, wild seeds, and nuts. Other stone tools were certainly an integral part of preparing and processing plant and animal foods, but their functions are too generalized to be included in this category.

Hunting. Mississippian arrow points are the only tool type placed in this category (Table 27). The Archaic and Woodland bifaces are excluded although some were undoubtedly utilized by Mississippians.

Cultivating/Excavating. Flakes and fragments that were once part of hoe blades are the only artifacts that indicate this activity (Table 28).

Woodworking. Groundstone celts, flakes, and fragments of chipped stone adze blades represent this activity (Tables 38 and 31). These tools were designed primarily for heavy woodworking tasks such as felling trees, preparing structure poles, and making large wooden utensils.

General Production and Maintenance. The tools in this unit are, for the most part, generalized tools that would have been employed to some degree in most of the above activities. These tools would have been central to basic household production and maintenance. Tool types include generalized scrapers, generalized cutting tools, hammerstones, flat and slotted abraders, macrodrills, spokeshaves/notches, and gravers (Tables 26 and 31).

Miscellaneous. The tools placed in this unit--microliths, denticulates, and sandstone saws--cannot be associated directly with any of the above activities. Microlith production and use was a specialized activity, apparently focused solely on the production of small drills used in the production of shell beads (Yerkes 1983). The actual functions of denticulates and sandstone saws are too problematic to assign them to an activity unit.

Discussion

Some measure of site function can be obtained by combining tools and debris into activity units (Table 32). The dominant activities represented in the lithic assemblage are processing and preparation of foodstuffs (37.7%) and stone tool production and maintenance (37.0%) (Figure 45). The prominence of these activities is due, in part, to the fact that the majority of the site's lithic waste materials--debitage and cracked rock--are divided between these two units. General production and maintenance is the third most common activity (16.6%) and is evidenced entirely by tools and no debris. The low frequency of hunting (1.4%), cultivating/excavating (2.5%), and woodworking (3.7%) activities is a direct result of these units primarily having only one or two tool or debris types indicating their presence in the assemblage.

As predicted, a wide range of activities are represented at the Bonnie Creek site. The most common activities were processing and preparation of foodstuffs, stone tool production and maintenance, and general production and maintenance. These are precisely the activities that should be most common at a fairly permanent habitation site.

Given that woodworking, cultivating/excavating, and hunting are specialized activities represented by only one or two tool and debris types, their low relative frequency in the assemblage still indicates that these were common activities. Furthermore, the relative frequency of these activities is understandable except for the higher frequency of woodworking over cultivating/excavating activities. Perhaps the large number of adze resharpening flakes (Table 32) is an indicator of intensive slash and burn horticulture. It should be noted, however, that some flakes detached from hoes do possess poorly developed low-gloss use polish. Thus, the adze flake category may be artificially

Table 32. Site Activities.

Activity Units	Total No. of Functions	Percent of Assemblage
Stone Tool Production and Maintenance Freehand Core (n=15) Bipolar Core (n=41) Decortication Flake (n=35) Block Shatter (n=142) Flake Shatter (n=92) Core Reduction Flake (n=127) Biface Reduction Flake (n=87) Flake Fragment (n=115) Anvil (n=29) Chert Hammer (n=2)	685	37.0
Processing and Preparation of Foodstuffs Mano/Grinding Stone (n=53) Metate/Grinding Slab (n=7) Pitted Stone (n=6) Cracked Rock (n=634)	700	37.7
Hunting Arrow Points (n=27)	27	1.4
Cultivating/Excavating Hoe Flakes and Fragments (n=48)	48	2.5
Woodworking Celt (n=2) Adze Flakes and Fragments (n=67)	69	3.7
General Production and Maintenance Generalized Cutting (n=98) Generalized Scraping (n=138) Hammerstone (n=32) Flat Abrader (n=12) Slotted Abrader (n=15) Macrodrill (n=4) Spokeshave/Notch (n=6) Graver (n=4)	309	16.6
Miscellaneous Microdrill (n=1) Microblade (n=4) Microlith Core (n=5) Denticulate (n=6) Sandstone Saw (n=2)	18	1.0
Total	1856	99.9

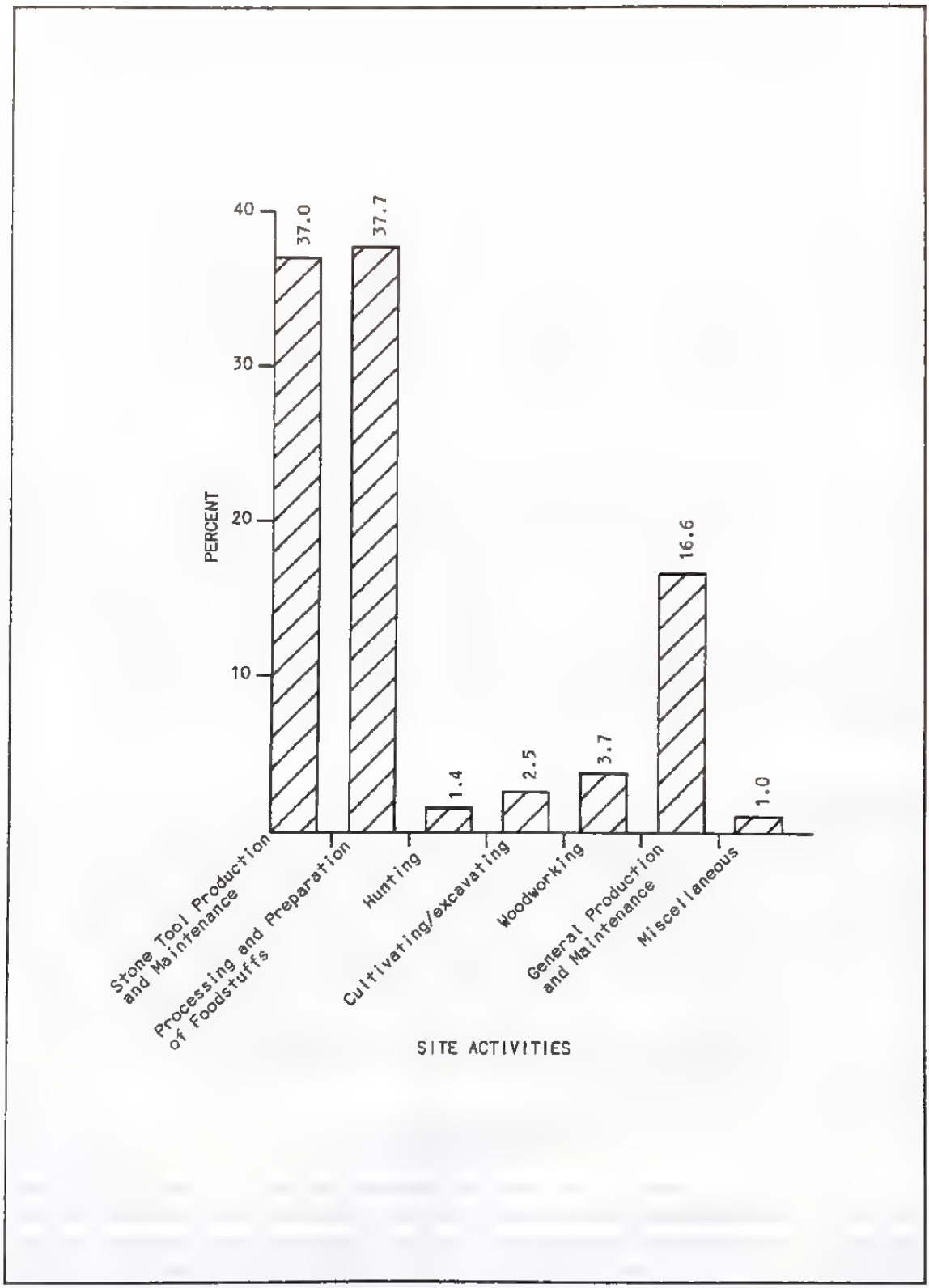


Figure 45. Site activities.

inflated at the expense of the hoe flake category. Another problem is the functional distinction between pitted stones (nut processing) and anvils (flint working, particularly bipolar). The high frequency of anvils and bipolar cores (Tables 29 and 31) and the low frequency of pitted stones and nut remains recovered from the site (Cremin, Chapter VII) appear to support the functional distinction between these tool types.

Under general production and maintenance, generalized cutting and scraping tasks were the most common, with scraping dominating over cutting. This may indicate a greater occurrence of scraping tasks, or it may be related to the method of analysis. A 10x hand lens was used to identify use wear on flake edges. Due to the expedient nature of the flake tool technology at the site, it is possible that some flake knives were not identified because their use was too brief to develop use wear that could be detected with only 10x magnification.

With regard to site activities, Table 32 presents a concise summary of the lithic tools and debris recovered from the Bonnie Creek site and their inferred functional relationships. It also provides a basic assessment of the degree to which certain activities are represented in the lithic assemblage. The percentages shown in the table are not an accurate measure of site activities as many factors need to be taken into account before a "realistic" measure of the activities performed at a site can be generated. Rather, the grouping of tools and debris into activity units is a heuristic device for gaining some assessment of site function. This procedure also permits similarly analyzed sites to be compared more easily.

Regional Context

The Bonnie Creek site was a Mississippian homestead situated in a chert-poor environment. Its lithic industries are nearly identical to those in the American Bottom. Consequently, the Bonnie Creek assemblage will first be compared and contrasted to the American Bottom; subsequently, it will be compared to assemblages from the Kaskaskia, Big Muddy, and Wabash drainages. The latter comparisons will be very brief due to the paucity of reports on analyzed Mississippian lithic assemblages outside the American Bottom and the often limited nature of many of these reports (e.g., little or no discussion of chert types, debitage, and nonformalized tools).

American Bottom

Contact with Cahokia-American Bottom populations is evident in the similarity of chipped stone tool technology and the raw materials employed. Nearly 17% of the chert from the Bonnie Creek site is Burlington, and a sizable portion of this is from the Crescent Hills source area. Small amounts of Fern Glen and Ste. Genevieve cherts were recovered as well. However, the inhabitants of the Bonnie Creek site relied more heavily on local chert sources--glacial till (34%) and Blair/St. David (16%). In most portions of the American Bottom,

Mississippians intensively exploited Burlington chert from the Crescent Hills in addition to small amounts of local cherts (Gregg 1975; Koldehoff 1985a, 1986b; Milner et al. 1984). At the Bonnie Creek site and in the American Bottom, Mill Creek chert is well represented, while Kaolin usually occurs in smaller amounts. Glacial till cherts (Glasford Formation) are available in the uplands that border the American Bottom but were infrequently utilized and usually in small amounts.

Technologically, the Bonnie Creek flake tool industry is similar to the recently defined Cahokia flake tool industry (Koldehoff 1986b). Both are expedient tool technologies that manufactured simple flake tools by direct freehand and bipolar percussion. They contrast in the types of raw materials utilized and the degree to which the two production techniques were employed. In the American Bottom, Crescent Hills chert was the dominant material used in flake tool production, while at the Bonnie Creek site, Crescent Hills, glacial till, and Blair/St. David were all intensively utilized. The contrasts between the industries are more marked in production techniques. Bonnie Creek site cores are predominantly bipolar (n=41, 73%), while few bipolar cores occur in the American Bottom. At the East Stockade area of the Cahokia site, only 12 (10%) bipolar cores were identified (Koldehoff 1985a). Identical procedures were followed in both industries; however, the high number of bipolar cores at the Bonnie Creek site is directly related to the scarcity of chert resources in the Galum Creek drainage. This is indicated by the low mean core weights (Table 29), small flake sizes, and intense recycling of large bifaces (Figures 43, 44). Chert scarcity apparently was not a problem for most Mississippian households in the American Bottom.

The large biface industry is identical in both areas. The Bonnie Creek site and Mississippian sites in the American Bottom received large bifaces in finished form and regularly maintained them. The inhabitants of the Bonnie Creek site, however, more intensively recycled large bifaces.

The microlith industry in both locations is also identical. The only difference is that Mill Creek was rarely used in microlith production in the American Bottom.

In sum, the Bonnie Creek site chipped stone industries are identical to those in the American Bottom except for variations in chert types and the extent to which certain techniques were employed. All of these variations can be explained by differential resouce availability. Technologically, the Bonnie Creek occupants and populations in the American Bottom were closely related.

With regard to formalized tools, one major difference exists in that at the Bonnie Creek site, formalized scrapers were more common than in most American Bottom Mississippian assemblages. Eighteen individual scrapers with at least two formalized edges were identified at the Bonnie Creek site (Figure 39). They represent 13% of the total number of scraping tools and 6% of the entire tool assemblage (when hoe and adze resharpening flakes are not included). In contrast, only one truly

formalized end scraper was found in the East Stockade area of the Cahokia site (Koldehoff 1985a). Few tools of this nature were identified during the recent I-270 Project (Emerson and Jackson 1984; Milner and Williams 1981, 1984). The paucity of formalized scrapers in the Cahokia region has been noted by Hall (1967:177) and Harn (1980:81). Both authors have also noted that Mississippian groups to the north and west of Cahokia (Spoon River and Steed-Kisker) typically possess fewer chert hoes and larger numbers of arrow points, scrapers, and knives. This pattern is also true for the upper Kaskaskia (Moffat 1985). Increased group mobility, scant lithic resources, and decreased emphasis on horticulture with increased emphasis on hunting and hide working are possible explanations for this pattern.

Kaskaskia Basin

A great deal of data has been generated on the Mississippian occupation of the Kaskaskia River basin, but few detailed studies of Mississippian lithics have been completed. A survey of the literature indicates that (1) Mill Creek hoe blades were consistently utilized and maintained, (2) triangular arrow points were common, and (3) simple flake tools apparently occur on most sites. Beyond this, little can be stated except for the recently excavated Bridges site (Hargrave et al. 1983) (Figure 32) in the central Kaskaskia valley and several sites in the upper Kaskaskia valley (Moffat 1985). Analysis of the Bridges site lithics (Billings 1983) has documented the intensive use of locally available glacial cherts. Burlington and Mill Creek cherts were present in minor amounts. The former occurred as cores and arrow points, while the latter was represented by hoe flakes. A surprisingly low frequency of hoe flakes was recovered from the site. An expedient flake tool industry was well represented at the site (Billings 1983:242), but a microlith industry similar to the Cahokia microlith industry was not identified.

In brief, recent data from Mississippian sites in the upper Kaskaskia indicate that local glacial cherts were heavily exploited and Mill Creek hoe flakes are rare (Moffat 1985). A well-developed flake tool industry is present, yet formalized tools (i.e., arrow points, drills, several types of scrapers, and small bifacial knives) were also common. Evidence of a Cahokia-like microlith industry was not identified.

Big Muddy Basin

The Big Muddy basin is much like the Kaskaskia; detailed studies of Mississippian lithics have not been conducted. However, fewer Mississippian sites have been excavated in the Big Muddy drainage. Small, triangular arrow points and Mill Creek hoe flakes are the common materials reported from sites.

Recent excavations at the Mike Adamson site (Wagner and McCorvie 1986) provide the best data on Mississippian lithic technology in the upper Big Muddy basin (Figure 32). At the Adamson site, southern Illinois cherts--Cobden, Kaolin, and Mill Creek, as a whole--comprised

the majority of the Mississippian lithic assemblage. As Wagner and McCorvie (1986:102) point out, the high frequencies of these nonlocal cherts on a Mississippian till plain site are unusual and may represent better access to these southern Illinois cherts due to river transport on the Big Muddy.

Local glacial cherts were heavily exploited as well, and some Burlington chert was recovered that may have been derived from the Crescent Hills source area (Mark Wagner, personal communication 1986). Mill Creek hoe blades were subjected to maintenance at the site, and a variety of flake tools and formalized tools were recovered. Microliths were not identified.

Wabash Basin

The Mississippian occupations of the Wabash valley and its tributaries is poorly documented. Winters (1967) provides few details on lithic tools in his survey report of the Wabash valley; he does note the presence of Mill Creek hoe fragments (1967:72) and illustrates a reworked hoe fragment (1967:Figure 22:B) that closely resembles a bipolar core.

The best available data on Mississippian lithic technology in the Wabash valley comes from recent work at the New Massilon site, a mound center in the central valley of the Little Wabash River (Figure 32) (Webb n.d.). Only a small portion of the site was excavated, with a limited number of stone tools recovered. Glacial cherts dominated the assemblage, with Burlington, Mill Creek, and other southern Illinois cherts identified. Some of the Burlington chert was identical to chert from the Crescent quarries. Mill Creek chert was represented by hoe flakes, while Burlington occurred as cores, debitage, one flake tool, and one adze resharpening flake. Triangular arrow points were common, and both freehand and bipolar cores were identified. Microliths were not recovered.

Discussion

The Bonnie Creek site assemblage is nearly identical to Mississippian assemblages in the American Bottom. General similarities exist between Bonnie Creek and assemblages recovered from other till plain sites in the Kaskaskia, Big Muddy, and Wabash drainages. A common characteristic of till plain sites is heavy utilization of glacial cherts. Mississippian populations throughout the southern till plains utilized Mill Creek large bifaces. Less common is the occurrence of Burlington chert. It is possible that Cahokia may have been exporting Burlington (Crescent Hills) cores and adzes to till plain populations. The distribution of Mill Creek and Kaolin large bifaces may have been controlled by centers in Union County, Illinois, or to some extent by Cahokia. All till plain populations appear to have had an economy based on horticulture, gathering, and hunting. Simple flake tool industries are common, but a microlith industry has been documented only at the Bonnie Creek site. However, a microdrill identical to those of the Cahokia microlith industry was recently recovered at a small site near

Carbondale, Illinois (Novelli 1986). It is 15.3 mm long and manufactured from Kaolin chert. Only rarely are Kaolin or Mill Creek microliths recovered in the American Bottom. Further study is needed to document the spatial distribution of the Cahokia microlith industry (e.g., Morse and Morse 1983:222).

Conclusions

Lithic tools and debris are consistently preserved items of material culture. The lithic assemblage from the Bonnie Creek site was subjected to technological, functional, and source area analyses. Data derived from these analyses were used to reconstruct (1) resource procurement strategies, (2) lithic industries, and (3) site activities. Major conclusions are:

1. Resource procurement at the Bonnie Creek site involved direct acquisition of locally available raw materials such as limestone, sandstone, igneous/metamorphic cobbles, limonite, glacial chert, and possibly Blair/St. David chert. With regard to chert, glacial and Blair/St. David accounts for nearly 50% of the chert in the assemblage, while just over 35% of the assemblage is comprised of cherts that had to be obtained from as far away as 40 to 100 km. Exchange is the most likely method by which these cherts were obtained.

2. Four lithic industries were identified and described: large biface, flake tool, microlith, and groundstone. Each industry was nearly identical to those in the American Bottom except for a few minor variations. First, the flake tool industry was based on three chert types--Burlington, Blair/St. David, and glacial till--compared to primarily Burlington in the American Bottom. Second, cores at the Bonnie Creek site were more intensively utilized by bipolar reduction. Third, large bifaces were more intensively curated and recycled at the Bonnie Creek site than in the American Bottom. Finally, the microlith industry at the Bonnie Creek site employed larger amounts of Mill Creek chert than is normally observed at Mississippian sites in the American Bottom.

3. Site activities were diverse and included stone tool production and maintenance, processing and preparation of foodstuffs, hunting, horticulture, heavy woodworking, general household production and maintenance, and possibly the production of shell beads. The best represented activities in the lithic assemblage are stone tool production and maintenance and food processing and preparation. The sum of the activities indicate that the Bonnie Creek site was a fairly permanent Mississippian habitation site that was self sufficient except for the acquisition from external sources of high quality chert and exotic minerals such as hematite, galena, and copper.

4. On the basis of chert procurement and lithic technology, the inhabitants of the Bonnie Creek site followed a generalized Mississippian till plain adaptation. However, they also had ties with the Cahokia system centered in the American Bottom.

CHAPTER VI. FAUNAL ANALYSIS

Jonathan A. Bloom

Introduction

The macrofaunal assemblage from the Bonnie Creek site is comprised of 1,443 pieces of faunal material (1,394 g) recovered by hand collection and from the systematic 1/4 in. and 1/2 in. screening of six 4 m^2 excavation units, seven pit features, one human burial, Structural Complex 1, and from the mechanical stripping backdirt piles.

Flotation samples produced an additional 2,039 pieces of bone, tooth, mussel and snail shell, and crustacean and insect exoskeleton fragments. Of these, 1,169 pieces (136.7 g) are assumed to be associated with the Mississippian occupations; 81 (0.58 g) specimens represent intrusive invertebrate species; and 789 (66.27 g) specimens are thought to be human skeletal fragments. This material was recovered from 19 pit features, 3 post molds, and 4 excavation units within Structural Complex 2. The macro- and microfaunal assemblages will be discussed separately and summarized.

The objectives of this analysis were to (1) provide frequency of recovery data for represented taxa; (2) examine faunal exploitation strategies of the inhabitants of the site; (3) provide data regarding the seasonality of occupation; (4) discuss the spatial patterning of faunal remains; and (5) compare patterns of faunal exploitation at the Bonnie Creek site with other Mississippian sites, including the Galum Crossing site (21C4-29) located in the northwest corner of the mine (Powell n.d.); site 21D3-67, a late Mississippian site located along White Walnut Creek (Higgins et al. 1984; Hoxie n.d.) in eastern Perry County; the Bridges site (11-Mr-11), Marion County, Illinois; and Mississippian occupations in the American Bottom.

Methodology

Each faunal element was identified to the most refined taxonomic level possible through interpretation of various morphological evidence. Material that could not be minimally assigned to the family designation was listed as indeterminate. Observations included (1) evidence of burning, with differentiation of calcined and burned/stained bone; (2) evidence of cultural modification; (3) evidence of butchering and skinning procedures; (4) side of the animal represented; (5) status of epiphyseal fusion; (6) evidence of rodent or carnivore gnawing; (7)

evidence of plant root effects; (8) the weight of the osteological sample per provenience; and (9) the minimum number of individuals (MNI) per taxon.

There are inherent biases that affect all faunal analytical work. Biases affecting the interpretation of the Bonnie Creek site faunal remains include (1) field and laboratory techniques; (2) the lack of understanding of cultural and natural site formation processes (c- and n- transforms) which affect bone, tooth, antler, and shell preservation (see Schiffer 1972; Schiffer and Rathje 1973); and (3) the multiple rebuilding episodes of Structural Complexes 1 and 2 indicate successive and not contemporaneous Mississippian occupations of the site. Successive occupations tend to destroy primary deposits during rebuilding activities.

Sampling strategies that result in small faunal assemblages present a common source of interpretational bias. At the Bonnie Creek site, however, all detectable subsurface features were hand excavated. All matrix was processed through a 1/4 in. (pit features) or 1/2 in. (excavation units and wall trenches) screen. Larger faunal specimens were hand collected during the excavation of burial 1 (feature 30) and from the mechanical stripping backdirt. Soil samples were removed from each feature prior to screening for flotation processing. Flotation samples were processed using the procedures described in the introduction of this report. Following flotation, the recovered material was passed through a 2.0 mm geologic sieve. The fraction retained by the sieve was sorted into material classes and analyzed. This technique was employed to maximize the recovery of microremains (Garson 1980; Oetelaar 1982, 1983; Struever 1968). All recovered faunal materials were submitted for analysis.

Macrofaunal Assemblage

The macrofaunal assemblage is comprised of fragments with a maximum dimension greater than 1/4 in. (i.e., those specimens recovered by hand collection and from 1/4 in. and 1/2 in. screening). This sample consists of 1,443 pieces of faunal material (1,394 g). Of these, 20.6% (n=297) were burned, calcined, or burned/stained; 0.1% (n=2) were rodent gnawed; and 0.3% (n=4) show signs of damage from root activity. Culturally modified bone and those exhibiting evidence of butchering constitute 0.7% (n=10) and 0.1% (n=1) of this assemblage, respectively. One specimen exhibits skinning cuts.

Identified elements represent 42.9% (n=619) of the total faunal assemblage and are attributable to two vertebrate classes, five orders, seven families, eight genera, and six species (Tables 33-36). One species of freshwater mussel was also identified although molluscan remains were poorly preserved. The indeterminate remains were subdivided into three vertebrate classes, one invertebrate class, and an indeterminate vertebrate category, the bulk of which are probably white-tailed deer.

Table 33. Frequency of Recovery of Faunal Remains from Excavation Units (NISP).

Taxa	Unit 42	43	44	45	46	47	Total
REPTILIA							
Terrapene spp. Box turtle	13						13
Chrysemys/Graptemys sp. Pond/map turtle	1						1
Indeterminate turtle	3			2			5
TOTAL REPTILIA	17			2			19
MAMMALIA							
Sciurus cf. *niger* Probably fox squirrel	1						1
Odocoileus virginianus White-tailed deer	25				1		26
cf. *O. virginianus* Probably deer	2		1				3
Indeterminate large mammal	41	1		2	3	2	49
TOTAL MAMMALIA	69	1	1	2	4	2	79
Indeterminate vertebrate	3						3
TOTAL VERTEBRATA	89	1	1	4	4	2	101
UNIONOIDA							
Indeterminate mussel	6				1		7
TOTAL IDENTIFIED	42		1		1		44
TOTAL NISP	95	1	1	4	5	2	108
TOTAL WEIGHT (g)	187	1	2	4	21	2	217

Table 34. Frequency of Recovery of Faunal Remains from Pit Features (NISP).

Taxa	Features 3	30	42A	42B	44	47	91	93	Total
REPTILIA									
Terrapene spp. Box Turtle			5		1		1		7
Indeterminate turtle			7	2					9
TOTAL REPTILIA			12	2	1		1		16
AVES									
Indeterminate bird			1						1
MAMMALIA									
Procyon lotor Raccoon			3		3				6
Mephitis mephitis Striped Skunk					12				12
Geomys bursarius Plains pocket gopher					1				1
Odocoileus virginianus White-tailed deer		3	5	1	95		2		106
cf. O. virginianus Probably deer			35		420		2	1	458
Indeterminate large mammal			56	5	251	2	64	25	403
Indeterminate medium or large mammal	1		18		72	2	1	1	95
TOTAL MAMMALIA	1	3	117	6	854	4	69	27	1081
Indeterminate vertebrate	2		1		147		6		156
TOTAL VERTEBRATA	3	3	131	8	1002	4	76	27	1254
UNIONOIDA									
Indeterminate Mussel		2	19						21
TOTAL IDENTIFIED		3	48	1	532		5	1	590
TOTAL NISP	3	5	150	8	1002	4	76	27	1275
TOTAL WEIGHT (g)	1	19	181	8	755	1	65	9	1039

Table 35. Frequency of Recovery of Faunal Remains from Structural Complex 2.

Taxa	Wall Trench	PP* #1	PP #2	PP #3	Unit S2-2	Total
MAMMALIA						
Odocoileus Virginianus White-tailed deer	1	1			1	3
Indeterminate large mammal	3		1		1	5
Indeterminate medium or large mammal	1					1
TOTAL MAMMALIA	5	1	1		2	9
Indeterminate vertebrate				1		1
TOTAL VERTEBRATA	5	1	1	1	2	10
TOTAL IDENTIFIED	1	1			1	3
TOTAL NISP	5	1	1	1	2	10
TOTAL WEIGHT (g)	3	3	1	1	19	27

* PP - Pieceplot

Table 36. Frequency of Recovery of Faunal Remains from Stripping.

Taxa	Number
REPTILIA	
Terrapene spp.	4
Box turtle	
Indeterminate turtle	3
TOTAL REPTILIA	7
AVES	
Indeterminate bird	1
MAMMALIA	
Odocoileus virginianus	12
White-tailed deer	
cf. *O. virginianus*	3
Probably deer	
Indeterminate large mammal	17
Indeterminate medium or large mammal	4
TOTAL MAMMALIA	36
Indeterminate vertebrate	2
TOTAL VERTEBRATA	46
UNIONOIDA	
Lampsilis teres spp.	1
Sand shell	
Indeterminate mussel	3
TOTAL UNIONOIDA	4
TOTAL IDENTIFIED	20
TOTAL NISP	50
TOTAL WEIGHT (g)	111

Molluscan remains were limited to 1 identifiable unionid specimen plus 31 indeterminate mussel shell fragments. Gastropod, piscene, and amphibian residues were not encountered in the macrofaunal assemblage. Reptilian remains constitute 4.0% (n=25) of the identified total and 2.1% (n=17) of the indeterminate remains. Avian skeletal elements were not identifiable beyond the level of class and represent only 0.2% (n=2) of the indeterminate material. Mammals account for 95.8% (n=593) of the identified remains and 74.3% (n=612) of the indeterminate material. Three orders, five families, and five species are represented. Several skeletal fragments attributable to Homo sapiens were encountered in the faunal assemblage. These elements are not considered as components of the faunal complex and were not incorporated into the tabulations. Unfortunately, all of the faunal samples were weighed prior to the identification and separation of the human skeletal fragments. The indeterminate vertebrate category (i.e., those fragments of indeterminate animal class affiliation) represented 19.7% (n=162) of the total indeterminate subassemblage.

Account of Species

Unionoida. The unionid component of the faunal assemblage consists of a single left valve of a slough or yellow sand shell, Lampsilis teres ssp., recovered from the mechanical stripping. Indeterminate freshwater mussel shell fragments were recovered from excavation units 42 and 46 and from feature 42. Molluscan remains were completely lacking from the 21D3-67 assemblage (Falk n.d.) but accounted for almost 28% by weight of all faunal remains recovered from the Mississippian component of the Galum Crossing site (Barr and Bloom n.d.). At the Bridges site, a few very poorly preserved mollusks were recovered. Analysis of this fragmentary material was not attempted (Oetelaar 1983).

The low frequency of freshwater mussels at the Bonnie Creek site and other nearby Mississippian sites implies either their infrequent use as a dietary supplement or poor preservation. Another interpretation is related to the use of mussel shell as tempering material in Mississippian ceramics. Bonnie Creek is a relatively small stream in the area of the site and may not have supported a large molluscan population. Should this have been the case, then nearly all of the mussel shells would have been used as ceramic temper, leaving only small fragments and occasional whole shells as refuse. As a source of nourishment, mussels provide a dietary supplement containing "far fewer calories per given unit than provided by most other meat animals" (Parmalee and Klippel 1974:432). Mussels are most easily collected by hand during the drier months of summer and fall when water levels are low.

Reptilia. The reptilian faunal subassemblage consists entirely of turtle shell fragments and represents 4.0% (n=25) of the identified total. Only the family Emydidae (i.e., box, pond, and map turtles) is represented. Twenty four of these fragments are attributable to box turtles (Terrapene spp.). The remaining fragment represents either Chrysemys sp. (pond turtle) or Graptemys sp. (map/false map turtle).

Shell fragments of these two genera are very similar, making species identification almost impossible from fragmentary material.

Box turtles were recovered from three features and from excavation unit 42, second only to white-tailed deer in frequency. This pattern was similarly observed at 21D3-67 and the Galum Crossing site (21C4-29). One indeterminate turtle shell fragment exhibits a slight polish on its interior surface. It is probably a remnant from a turtle shell bowl or rattle.

Box turtles are common in most wooded areas (Terrapene carolina) as well as on the more arid prairies and grasslands (Terrapene ornata). Most species of turtles are generally available between April and October/November (Carr 1952; Parmalee 1955; Smith 1961). Box turtles become most active during their spring and fall migration periods when they travel to and from their hibernation areas and may be collected in quantity at these times. It is more likely, however, that they were collected incidentally when encountered during other daily activities.

Neither fish nor amphibian residues are represented in the macrofaunal assemblage, a pattern also observed at 21D3-67 and the Galum Crossing site (21C4-29). The Bridges site macrofaunal assemblage contained bowfin, sucker, catfish, and bass, reflecting the greater importance and/or availability of aquatic resources in the central Kaskaskia valley.

Aves. Avian remains were limited to two indeterminate fragments, one from feature 42 and the other from the mechanical stripping. This lack of representation is open to various interpretations. The Mississippian components of two nearby sites, 21D3-67 (Falk n.d.) and 21C4-29 (Barr and Bloom n.d.), also contained limited avian material. In these two situations, however, the low frequency of avian remains could be related to the small sample size. The Mississippian component of the Bridges site contained a variety of avian material recovered from approximately 27% (n=19) of the Mississippian pit features (Oetelaar 1983). Whether the low frequency of avian material at the Bonnie Creek site represents degree of availability, cultural preferences for particular animal species, season or length of occupation, differential preservation, or differential discard is unknown.

Mammalia. Mammals are the most frequently represented animal class. In order of most frequent recovery, this subassemblage is composed of white-tailed deer, striped skunk, raccoon, squirrel, and plains pocket gopher. As noted from many prehistoric faunal assemblages from the eastern United States and supported by ethnographic data, white-tailed deer was the most important and most frequently exploited mammal, providing the bulk of animal protein, hides, and a source of raw materials for tool and ornament manufacture (i.e., bone, tooth, and antler).

Deer (including the "cf." category) constitutes 96.6% (n=573) of the identified mammalian subassemblage and were recovered from five pit features, Structural Complex 2, burial 1 (feature 30), excavation units,

and mechanical stripping. Although deer was the most ubiquitous species at 21C4-46, the large number of deer bone fragments is a direct function of the highly friable condition of this material. Fragmented deer bone is believed to constitute approximately 41.4% of the indeterminate remains.

A minimum of three deer is indicated by three distal left radii and three proximal right radii. The recovery of a pair of frontal bones with pedicels revealing the antlers had been shed indicates that at least one deer was a male and that the time of procurement was between early January and late March (Hawkins et al. 1968). This infers at least a winter occupation of the Bonnie Creek site.

Although limited, the evidence for winter deer procurement corresponds to Smith's (1975) hypothesis of exploitation at optimum density during fall and winter. During these months, deer aggregate in the upland hardwood forests to feed on the acorn mast and attain their maximum annual weight.

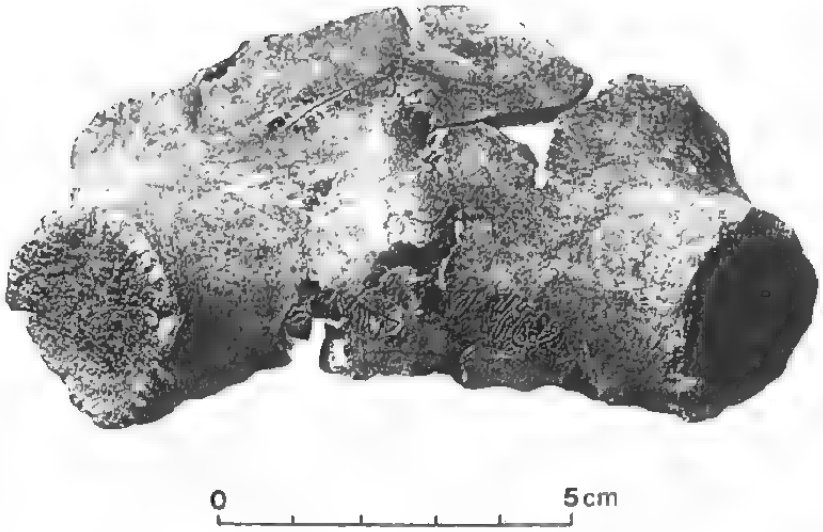
The 158 skeletal elements (Odocoileus virginianus) may be subdivided into axial (39.2%, n=62), pectoral (24.0%, n=38), and pelvic (26.0%, n=41) anatomical portions (Table 37). The greater representation of axial portions is due to the large number of dental fragments (n=30) which constitute about 19.0% of the deer remains. Although it is interesting to note the absence of cervical vertebrae in this subassemblage, at present no explanation can be offered. The frequency of recovery of the various anatomical portions indicates that the entire animal was returned to the site for processing.

Deer bone fragments exhibiting evidence of food processing (i.e., butchering cut marks) were infrequent. All long bones were broken in half and splintered, presumably for marrow extraction. Only one deer element with butchering cuts was recovered. The proximal half of a right radius exhibits cut marks on the proximal-anterior and antero-lateral aspects, a common pattern of disarticulating the forearm noted also by Breitburg (1982), Guilday (1971), Guilday et al. (1962), and Parmalee (1965). The previously mentioned frontal bones exhibited skinning cuts anteriorly around the antler bases (Figure 46a). As described by Guilday et al. (1962:75), ". . . if the animal was a buck, the skin was carefully cut away from the antler bases as skinning proceded over the head."

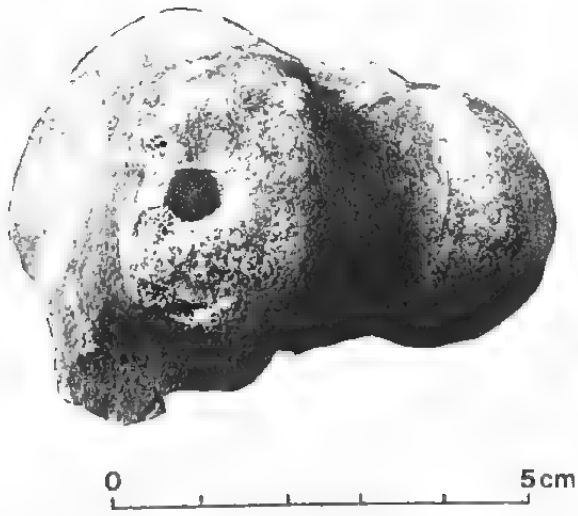
The brain was probably extracted for food or for tanning hides (Swanton 1946). Referring to brain removal, Guilday et al. (1962:77) note that "the brains were removed by chopping into the skull itself, or by splitting the entire head and neck section into right and left halves with an ax." "Forty one skulls had been opened by making two transverse ax blows, one across the brow just above the orbits and in front of the pedicels; the other, delivered from the rear and above, cut slantingly forward under the eyes and antler bases to sever the basisphenoid" (Guliday et al. 1962:75). The cranial specimen recovered from feature 44 at the Bonnie Creek site is considered to have resulted from the latter method and later modified for further use (Figure 46a). Two

Table 37. Frequency of Recovery of Skeletal Elements of the White-tailed Deer.

Anatomical Portion	Number	Percent
Axial		
Antler	3	
Cranial	4	
Mandible	4	
Dental	30	
Cervical	-	
Thoracic	4	
Lumbar	8	
Sacral	2	
Vertebra fragments	5	
Ribs	2	
Total Axial	62	39.2
Pectoral		
Scapula	2	
Humerus	7	
Ulna	15	
Carpals	5	
Metacarpals	5	
Total Pectoral	38	24.0
Pelvic		
Innominate	1	
Femur	21	
Tibia	6	
Tarsals	8	
Metatarsals	5	
Total Pelvic	41	26.0
Miscellaneous		
Metapodial fragments	11	
Phalanges	6	
Sesamoids	-	
Total Miscellaneous	17	10.8
Total Deer Remains	158	100.0



a. Deer cranium with skinning cuts at antler bases.



b. Drilled distal right femur (deer).

Figure 46. Modified faunal material.

additional deer skeletal fragments also exhibit evidence of modification. These include a distal right femur with a hole drilled into the lateral condyle (Figure 46b) and a femur metaphyseal fragment used as a scraper (Table 38).

Smaller mammals were taken in addition to the white-tailed deer. Mammalian species represented in this subassemblage and considered to be of secondary importance include striped skunk, raccoon, squirrel, and possibly the plains pocket gopher. Skeletal remains attributable to the striped skunk (Mephitis mephitis) are limited to dental fragments and a right horizontal ramus fragment from feature 44. A single individual is indicated. The striped skunk is a woodland animal preferring forest edge habitats though never straying far from a source of water. The skunk is available year-round except during the coldest days of winter at which time it remains in its den asleep (Hoffmeister and Mohr 1972). The Iroquois considered the meat of the skunk to be good for various ailments (Waugh 1916:135).

Raccoon (Procyon lotor) was represented in features 42 and 44 by a left horizontal ramus fragment, left ulna fragment, right temporal fragment, and dental fragments, suggesting the occurrence of a single individual. Raccoons are common inhabitants of all wooded areas but prefer wooded river bottoms where they search for food along streams or other bodies of water.

Evidence of utilization of squirrels is indicated by a single metatarsal recovered from excavation unit 42. This element compares best with that of the fox squirrel (Sciurus niger). The fox squirrel prefers forest edge habitats.

A single burned tooth of the plains pocket gopher (Geomys bursarius) was recovered from feature 44. Skeletal remains of the plains pocket gopher are frequently reported in archaeological faunal assemblages in Illinois (e.g., Bloom 1982, 1985; Breitburg 1982; Oetelaar 1983; Parmalee 1975; Parmalee et al. 1972). The presence of this species in archaeological contexts (Schiffer 1972; Schiffer and Rathje 1973) is usually considered to be intrusive corresponding to their habitat preference for brown silt loam soils (Mohr 1935) associated with grassland environments.

At a permanent or semipermanent aboriginal settlement, it is possible that pocket gophers could damage crops, disturb pit features containing stored food, and disrupt cleared areas. Subsequently, one might expect there to have been some effort at pest control. Mention of such behavior can be found in the ethnographic (Beals 1945) and ethnoarchaeological (Beals 1943) literature: "Gophers are trapped in an ingenious manner, but primarily to protect the fields, not to secure food" (Beals 1945:12). Consequently, the skeletal remains of pocket gophers in the archaeological context may be the remains of exterminated pests. This hypothesis may explain the frequently observed remains of pocket gophers in archaeological faunal assemblages.

Table 38. Description of Modified Bone.

Provenience	Description
Feature 42	One indeterminate large mammal metaphyseal fragment (probably deer) has a slight polish on part of its exterior surface.
Feature 42	One calcined indeterminate large mammal metaphyseal fragment has been shaped and ground smooth. It measures 22 mm long, 7 mm at its greatest width, and 3 mm at its tapered end. Its point is broken off. This fragment may represent an awl-like tool or ornament.
Feature 42A	One calcined indeterminate large mammal metaphyseal fragment (probably deer) exhibits polish longitudinally on half of the exterior surface.
Feature 44	One pair of white-tailed deer frontal bones with pedicels showing the antlers had been shed (Figure 46a). Both pedicels have their ventral aspects cut flat. This is best exemplified by the right pedicel. The cut surface of the right pedicel has been ground smooth. The cut surface of the left pedicel is roughened except for a small surface medial to the main cut area. The functional aspect for this modification is unknown.
Feature 44	One white-tailed deer femur metaphyseal fragment, one end of which has been used as a scraper.
Feature 44	The distal end of a right femur from a white-tailed deer has a 6 mm diameter hole drilled into the lateral condyle at the muscle scar to a depth of approximately 12 mm at about a 45° angle to the long axis of the femur (Figure 46b). The medial aspect of the medial condyle has been ground smooth, possibly extending proximally along the patellar groove. The flattened surface thus produced may have served as a standing platform. This element may have functioned as a stand for something which would have been inserted into the aperture or possibly as a game piece.
Feature 44	One side of an indeterminate large mammal fragment (probably deer) has been ground smooth.
Mechanical Stripping	One indeterminate turtle shell fragment has a slight polish on its interior surface. This artifact is probably the remnant of a turtle shell bowl or rattle.

Table 38. (Cont'd).

Provenience	Description
Mechanical Stripping	One indeterminate artiodactyle bone fragment reveals a slight polish.
Mechanical Stripping	One burned indeterminate large mammal metaphyseal fragment exhibits polish and light transverse striae on the exterior surface.

In sum, the mammalian faunal assemblage is limited. White-tailed deer represent the primary source of animal protein, hides, and raw material for tool manufacture. Species such as the striped skunk, raccoon, squirrel, and possibly the plains pocket gopher were of secondary importance. Remains of the plains pocket gopher may be the result of pest control to protect crops and subsurface pit features. Forest edge habitats were the focus of mammalian exploitation strategies. The bottomland forests provided a secondary faunal resource base. Evidence for the utilization of aquatic and semiaquatic mammals such as mink, muskrat, and beaver is lacking. Prairie and grassland environments existed locally but apparently were of minimal importance to overall subsistence at the Bonnie Creek site.

Microfaunal Assemblage

The term "microfaunal" is a descriptive term for faunal residues recovered by 2.0 mm flotation. As expected, the microfaunal assemblage complements the macrofaunal assemblage and provides a more complete picture of Mississippian subsistence activities at the Bonnie Creek site (Tables 39-41).

This assemblage contains elements of species previously recorded for the macroassemblage plus several additional taxa. In order of most frequent recovery, the microassemblage includes white-tailed deer, box turtle, tree squirrel, vole, rabbit, probable sucker (Catostomidae), probable sunfish (cf. Lepomis sp.), at least four genera of terrestrial gastropods, and a single genera of beetle (Coleoptera). The indeterminate material consists of large, medium, and small mammal bone and tooth fragments plus turtle, fish, crayfish, mussel, and gastropod remains. Amphibian, snake, and avian species were not represented. The identification of two avian eggshell fragments weighing 0.03 g recovered from feature 30 (burial 1) has been confirmed with the aid of a scanning electron microscope. The significance of this find will contribute to our knowledge of site formation processes, neotaphonomy, and seasonality. A detailed presentation of this identification and subsequent interpretation is anticipated in a future publication.

Table 39. Frequency of Recovery of Faunal Remains from Flotation (NISP). Pit Features.

Taxa	Feature No. 9	30	37	38	42A	42B	43	44
OSTEICHTHYES								
cf. Catostomidae Probably sucker		1						
cf. Lepomis sp. Probably sunfish		1						
Indeterminate fish		5						
TOTAL OSTEICHTHYES		7						
REPTILIA								
Terrapene spp. Box turtle		8		1	2			
Indeterminate turtle		78			1	1		4
TOTAL REPTILIA		86		1	3	1		4
MAMMALIA								
Sciurus sp. Tree squirrel		1						
cf. Sciurus sp. Probably squirrel		1						
Microtus cf. ochrogaster Probably prairie vole		1						
cf. Microtus sp. Probably vole		1						
Cricetidae Small rodent		2						
Sylvilagus spp. Rabbit		1			1			
Odocoileus virginianus White-tailed deer		11		1	6			24
cf. O. virginianus Probably deer					1			
Indeterminate large mammal		57		3	57			49
Indeterminate medium or large mammal		322			18	2		429
Indeterminate medium mammal		2						
Indeterminate small mammal		4						1
TOTAL MAMMALIA		403		4	83	2		503
Indeterminate vertebrate	2	298	1	10	24	5	1	66
TOTAL VERTEBRATA	2	794	1	15	110	8	1	573

Table 39. (Cont'd).

Taxa	Feature No. 47	49	52	53	54	91	92	93	94	95
REPTILIA										
Terrapene sp. Box turtle				1						
Indeterminate turtle				1		1			1	
TOTAL REPTILIA				2		1			1	
MAMMALIA										
Odocoileus virginianus White-tailed deer	18					5				
cf. *O. virginianus* Probably deer						1				
Indeterminate large mammal	2		2	8		5		15	3	1
Indeterminate medium or large mammal	2		1	5	2	22	1		4	
TOTAL MAMMALIA	22		3	13	2	33	1	15	7	1
Indeterminate vertebrate	27	3	12	12	1	40		47	19	7
TOTAL IDENTIFIED	18			1		6				
TOTAL NISP	49	3	15	27	3	74	1	62	27	8
WEIGHT (g)	1.77	0.1	1.00	3.30	0.80	6.19	0.03	2.83	2.04	0.86

Table 40. Frequency of Recovery of Faunal Remains from Flotation (NISP), Features and Post Molds, Structural Complex 2.

Taxa	Features 75	76	---Post Molds--- 71	80	90
Indeterminate large mammal	8				
Indeterminate medium or large mammal	1	2	2		1
Indeterminate vertebrate	29	26		1	
Total NISP	38	28	2	1	1
Weight (g)	4.35	1.47	0.07	0.01	0.01

Table 41. Frequency of Recovery of Faunal Remains from Flotation (NISP), Excavation Units, Structural Complex 2.

Taxa	S2-17 (20-30 cm bs)	S2-18 (20-30 cm bs)	S2-29 (20-35 cm bs)
VERTEBRATA			
Odocoileus virginianus White-tailed deer			1
Indeterminate medium or large mammal		1	
Indeterminate vertebrate	1	4	
Total NISP	1	5	1
Weight (g)	0.02	0.10	0.01

Mammalian species recovered by flotation but not present in the screened sample include rabbit (Sylvilagus sp.) and vole. The vole residues (and possibly the indeterminate small rodent remains (Table 39) possibly represent the remains of an intrusive individual. Fish (cranial and vertebra fragments) and crayfish (claw fragment) residues were recovered only from the midden area (burial 1 fill, feature 30) (Table 39). These taxa could have been procured from Bonnie Creek during the warmer months of the year.

Most (96.2 %) of the terrestrial gastropods were recovered from the midden (Table 42). The four genera represented are generally associated with moist leaf litter environments although A. Kochi and one genera of Euconulus (i.e., E. dentatus) may occur in drier situations (Hubricht 1985).

Table 42. Frequency of Recovery of Intrusive Invertebrate Remains From Flotation (NISP).

Taxa	Feature 30	Feature 44	Feature 64
GASTROPODA			
cf. Anguispira Kochi Terrestrial gastropod	19	1	
Helicodiscus parallelus Terrestrial gastropod	5		
Hawaiia minuscula Terrestrial gastropod	20		1
Euconulus sp. Terrestrial gastropod	1		
Indeterminate terrestrial gastropod	3		
Indeterminate gastropod	3		
TOTAL GASTROPODA	51	1	1
COLEOPTERA			
Thecesternus cf. affinis Beetle	1	27	
Gastropoda Weight(g)	0.33	0.01	0.01
Coleoptera Weight (g)	0.01	0.22	

Several insect exoskeleton fragments were recovered from feature 44 (Table 42). The 27 specimens from feature 44 and the single specimen from feature 80 were identified as Thecesternus cf. affinis (Coleoptera: Curculionidae). The represented elements consisted primarily of the elytra, or wing covers. These beetle exoskeleton fragments were encountered as a localized concentration within the fill of feature 44. The occurrence of this insect in archaeological deposits probably exemplifies postdepositional bioturbation (Wood and Johnson 1978).

Spatial Distribution of Faunal Remains

The spatial distribution of archaeological materials can provide insights into patterns of intrasite organization and space use (e.g., Anderson 1982; Oetelaar 1985; Portnoy 1981). In this section, the distribution of faunal remains at the Bonnie Creek site will be used to determine the possible locations of refuse disposal or dump areas.

Investigation of the spatial patterning of faunal remains consisted of a three-phase study. The first phase entailed plotting the frequency of recovery of faunal remains from the test excavation units (Figure 47). These remains were linearly distributed in a north-south pattern slightly east of the site center. The density, diversity, and weight of the samples were greater in the northernmost (42) and southernmost (46) excavation units (Table 33) and decreased toward the site center near the structures (Figure 47). The northernmost unit (42) contained the highest density of materials including 90 vertebrate faunal remains and 6 freshwater mussel shell fragments (Table 33). Based on these data, excavation unit 42 is thought to have sampled the main refuse disposal area. The densities at this provenience of other cultural materials such as ceramics and rock (Table 6) and lack of subsurface features support this hypothesis.

The decreasing density of faunal remains toward the main residential area coincides with expectations concerning space use and intrasite organization in sedentary populations (Anderson 1982; Dodd 1984; Hayden and Cannon 1983; Oetelaar 1985; Portnoy 1981). The increase in density and diversity of faunal materials in unit 46 may signify the location of a second refuse disposal area (Table 33). The lower density of faunal material at this location indicates this refuse disposal area was used to a lesser degree than the corresponding dump to the north. It should also be noted that during testing, human skeletal remains and mussel shell fragments were only recovered from the two proposed refuse disposal areas.

The second phase of investigations was to plot the recovery of faunal remains from pit features (Figure 48, Tables 32, 38-40). Note the spatial hiatus between the pit features containing faunal remains (Figure 48) and locations of the two proposed dump areas (Figure 47). Ethnographic accounts indicate that to prevent interference with horticultural activities and other daily routines, hard refuse such as rocks are discarded at locations outside the residential compound (Hayden and Cannon 1983). If both of these locations were indeed refuse

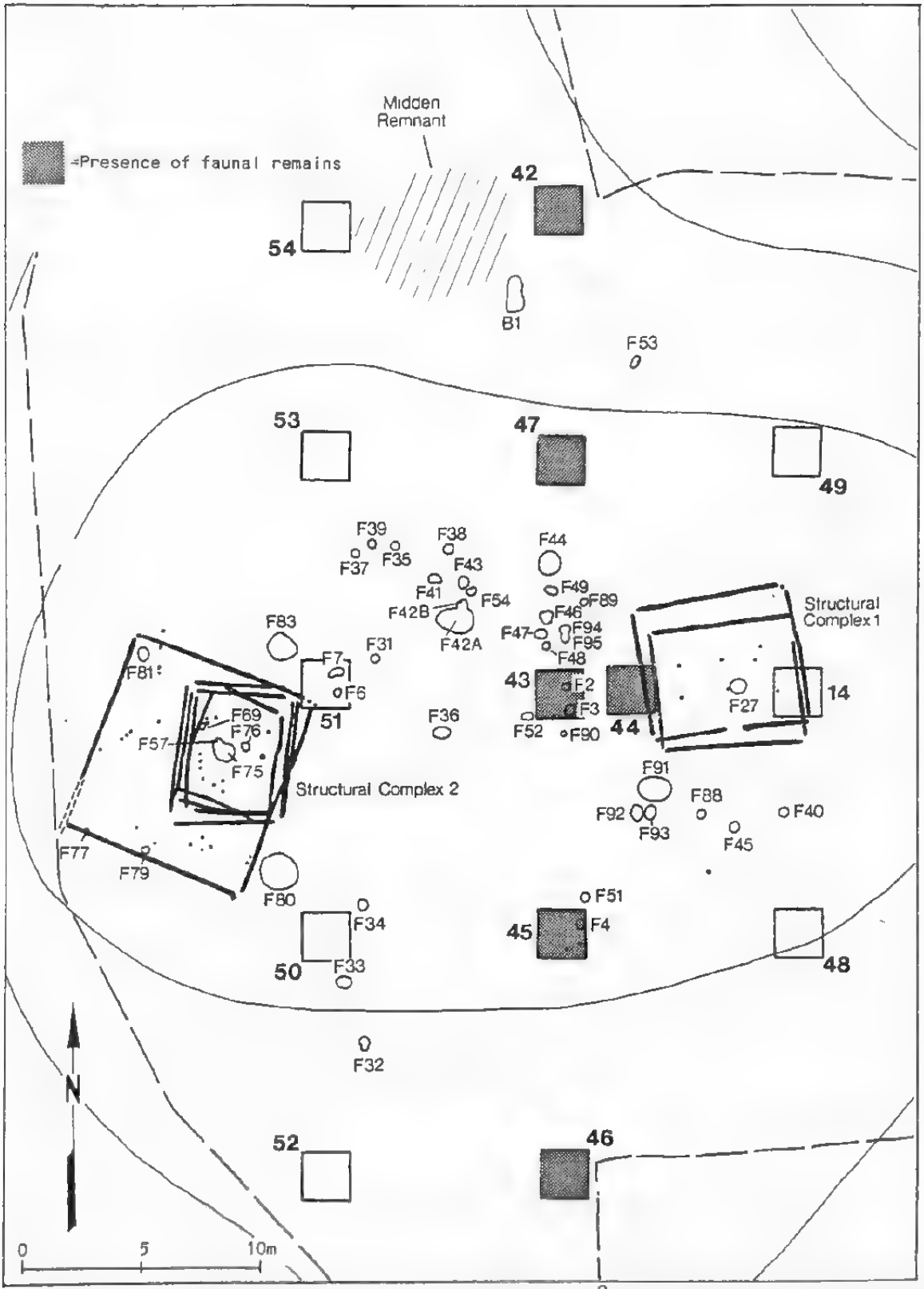


Figure 47. Distribution of faunal remains, 4 m^2 units, Bonnie Creek Site.

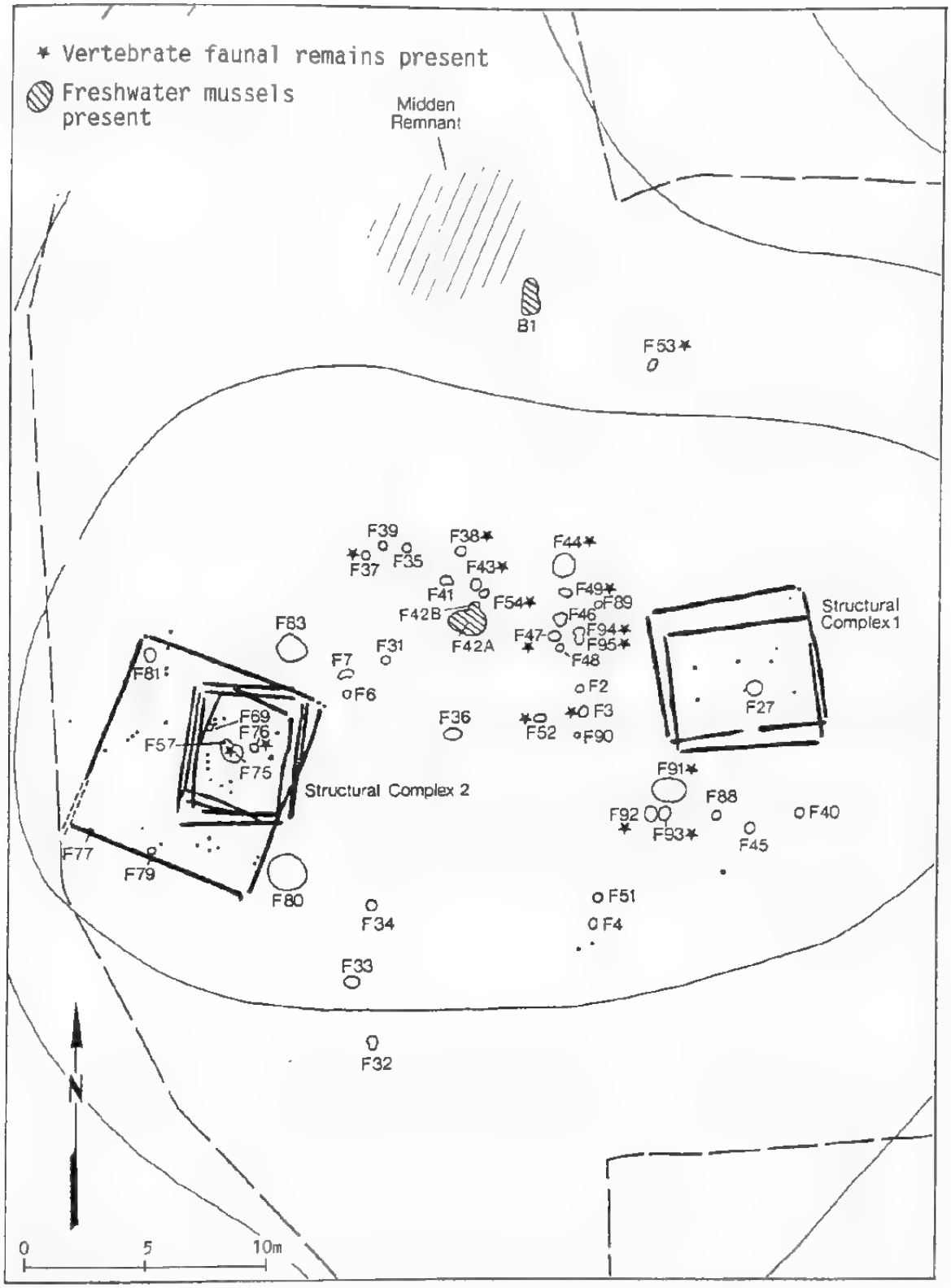


Figure 48. Distribution of faunal remains from pit features, Bonnie Creek site.

disposal areas, they should exhibit certain common characteristics. Common factors shared by the two areas include: (1) both have the same diversity of faunal (and human) remains, (2) both are down-wind of the main residential area, (3) both occur in areas downslope (although only slightly) of the residential area, and (4) both are separated from the residential area by a spatial hiatus.

The third part of the investigations involved the analysis of all shell-tempered ceramics to determine whether shell temper was still preserved on the exposed surfaces or whether these fragments had been leached out. This analysis was based on the assumption that the organic content of the midden areas would provide an environment favorable to the preservation of shell in contrast to the more acidic site soils. Soil acidity at the site is inferred from the general quality of faunal remains recovered from pit features 42 and 44. Although both of these pit features contained high densities of faunal material, the bone was quite fragmentary.

As predicted, mussel shell temper was preserved almost exclusively in the proposed refuse disposal locations (Figures 49 and 50). Figure 49 illustrates the recovery of preserved shell temper fragments from both the .25 m^2 units (black squares) and their associated 4 m^2 units (not shown). Figure 50 is an enlarged version of Figure 49, showing only the 4 m^2 units. The sherds from all other proveniences had their shell fragments leached out with the following exceptions. The shell tempering in one sherd from a wall trench (feature 61) of Structural Complex 2 contained shell in its interior but none on the exterior surface. This same differential preservation was noted for a single sherd from feature 44. In excavation unit 8, shell temper was preserved in the sherds from level 1 (0-10 cm bs). In excavation units 17 and 24/46, shell tempering was leached out from the sherds from level 2 (10-20 cm bs) but was preserved in sherds from level 3 (20-30 cm bs). In excavation unit 34/42, some sherds from level 2 (10-20 cm bs) retained shell temper while others did not. All sherds from level 3 of unit 34/42 contained shell.

Summary

One unionid, four gastropod, one crustacean, one insect, two piscene, two reptilian, and seven mammalian taxa are represented in the Bonnie Creek faunal assemblage. Amphibian reisdues were not recovered. Avian remains were limited to two indeterminate fragments.

Based on the recovery of white-tailed deer, skunk, and fox squirrel, forest edge habitats appear to have been the focus of faunal exploitation strategies. Woodland areas provided secondary resources (i.e., raccoon). Prairies, as indicated by the occurrence of the plains pocket gopher, existed within proximity to the Bonnie Creek site during the Mississippian occupation but were not extensively utilized. The bottomland and creek environments contributed little to the overall subsistence at the site. Although the faunal assemblages from site 21D3-67 and the Galum Crossing site (21C4-29) are subject to the bias of

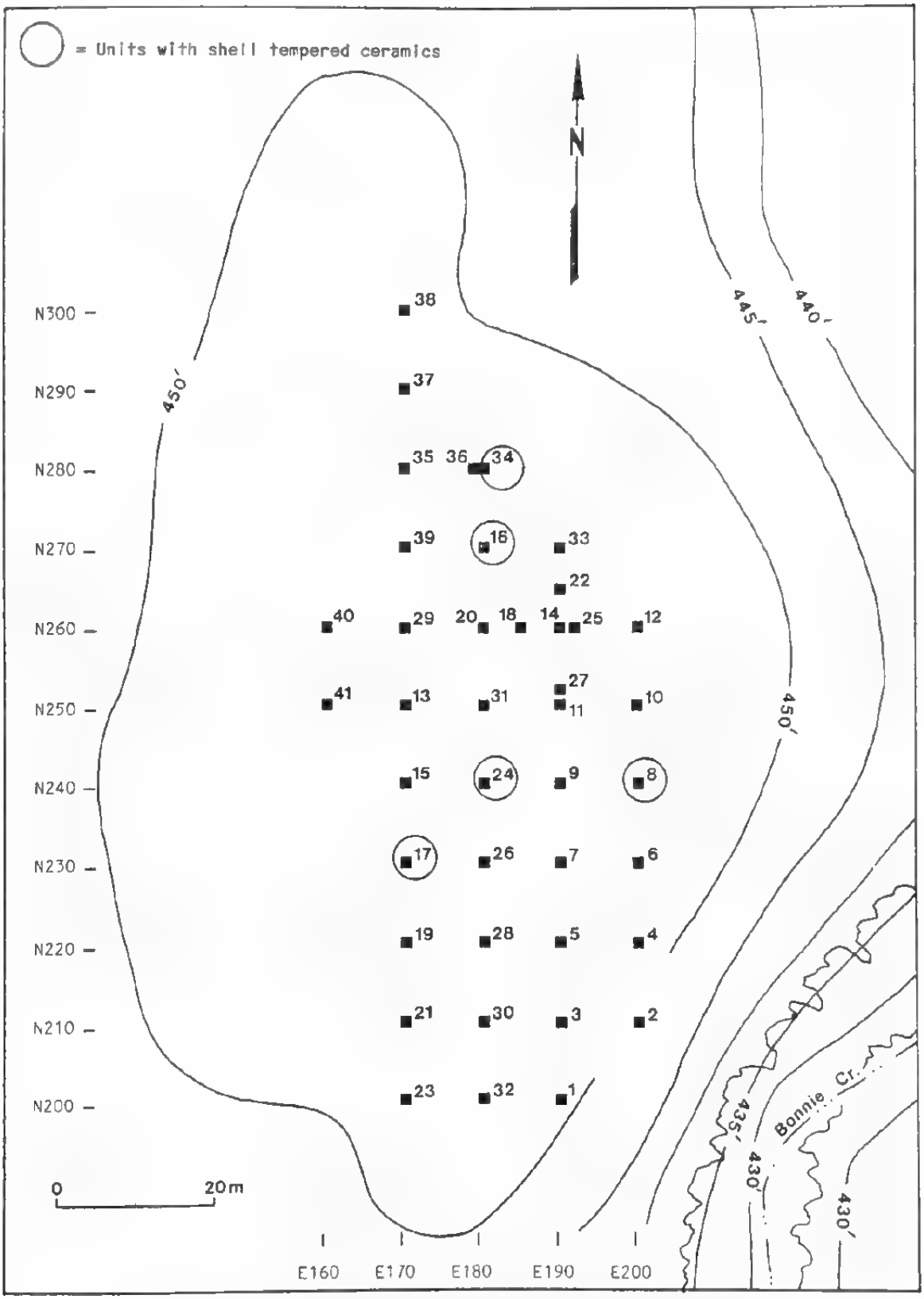


Figure 49. Distribution of Mississippian ceramics retaining shell temper, .25 m^2 units, Bonnie Creek site.

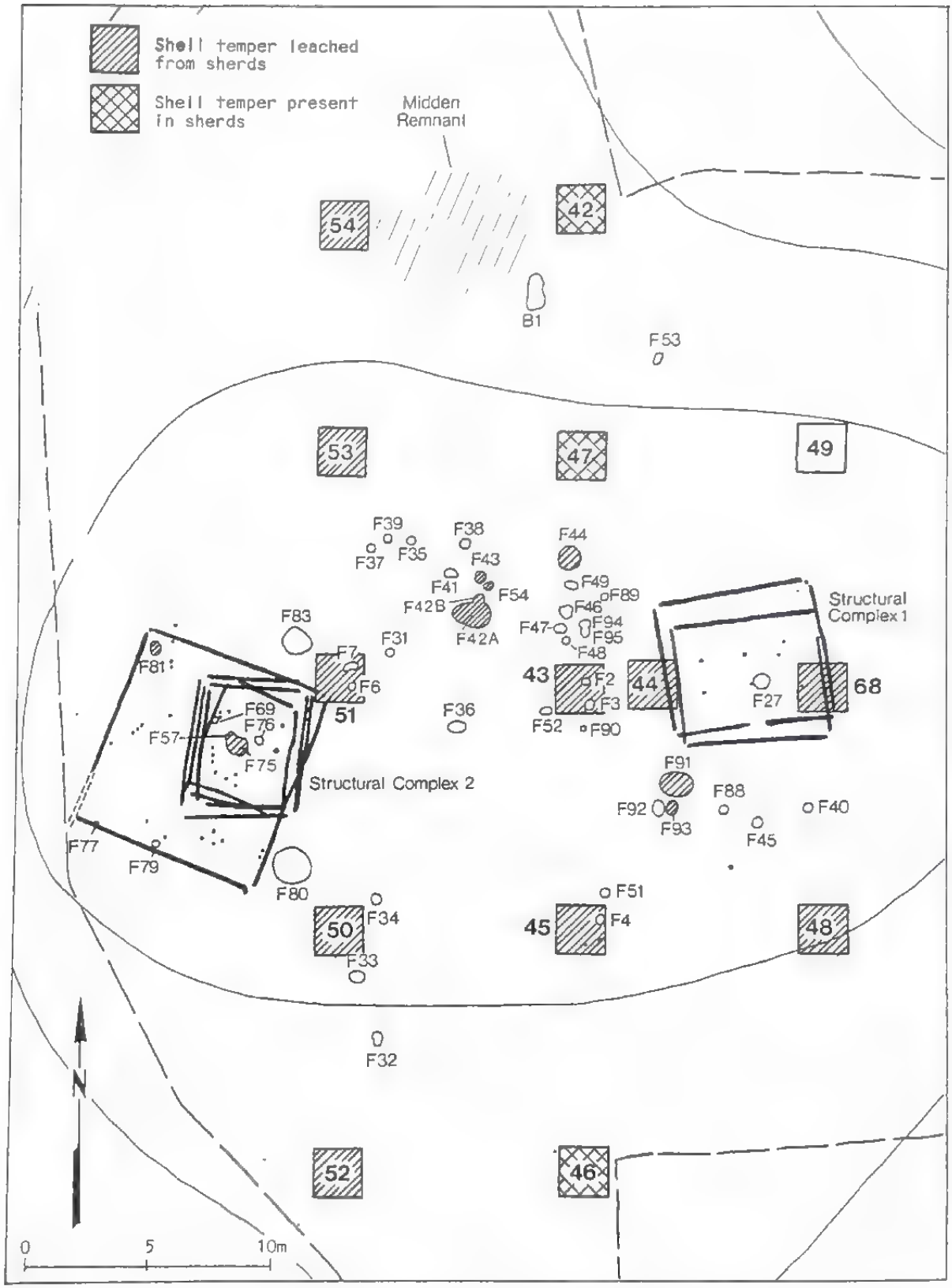


Figure 50. Distribution of Mississippian ceramics by presence/absence of shell temper, 4 m^2 units, Bonnie Creek site.

small sample size, the same general pattern of faunal exploitation is indicated at these sites.

Information regarding the seasonality of site utilization is sparse but does lend itself to interpretation. A winter occupation between early January and late March is inferred from the recovery of a pair of deer frontal bones indicating shed antlers. The procurement of emydid turtles would most likely have occurred during the warmer months between April and October/November. Freshwater mussels are most easily collected when water levels are at their lowest, usually during summer and fall.

As at the Galum Crossing site (21C4-29), the presence of corn at the Bonnie Creek site suggests occupation by late spring for soil preparation and planting. Harvesting may have taken place in September or October, coinciding with fall nut gathering activities. Combined with the faunal data, this evidence suggests a multiseasonal or year-round occupation of the site.

The spatial patterning of faunal materials indicates that two refuse disposal areas were present at the site. The area containing the higher density of materials lies to the northeast of the main residential area. The second area is located to the southeast. Whether these two refuse disposal areas were contemporary, are the remnants of a more extensive dump area surrounding Structural Complex 1, or are associated with separate Mississippian occupations of the site cannot be established.

Regional Comparisons

The Mississippian inhabitants of the Bridges site in the Kaskaskia River valley utilized a more generalized faunal exploitation strategy than is evidenced at the Bonnie Creek site (Oetelaar 1982). Fish represent the most ubiquitous animal class. Aquatic, riverine, lacustrine, plains, woodlands, and forest edge habitats are all well represented by the occurrence of their associated fauna. The high incidence of bird bone is noted as significant. At the Bonnie Creek site, site 21D3-67, and the Galum Crossing site (21C4-29), the low incidence of bird bone is noted as significant. Hargrave and Butler (1983:346) have concluded that the "evidence points to long-term, multi-seasonal, or year-round occupation by Mississippian groups" at Bridges.

The recent archaeological work resulting from the FAI-270 project allows for comparison of the Bonnie Creek site data with Mississippian subsistence strategies in the American Bottom. Extensive exploitation of the abundant aquatic environments in this area is noteworthy. Fish remains constitute 49.1% and 75.4% of the faunal material from the Julian and Range sites, respectively (Kelly and Cross 1984:231). Similarly, the "extreme importance" of fish "in the daily subsistence of the Cahokia inhabitants" has been noted by Parmalee (1975:145).

As at the Bridges site, special comment is made of the abundance and variety of avian species at Mississippian sites in the American Bottom. The avian subassemblage varies in representation, from 8.8% of the Range site faunal material to 41.4% at the Carbon Dioxide site. A decline in the utilization of terrestrial birds such as prairie chicken and quail is noted from the Emergent to later Mississippian periods (Kelly and Cross 1984:231). The paucity of reptilian remains at the Julian, Carbon Dioxide, Lohmann, and Range sites suggests a relatively insignificant dietary contribution from this class. Parmalee (1975:150) made similar observations for subsistence at Cahokia. Kelly and Cross (1984:232) conclude that the FAI-270 sites support the idea (Smith 1975:139) that this intensive, localized pattern of faunal exploitation may be characteristic of prehistoric occupations along the major river valleys in eastern North America.

The faunal assemblage from the Bonnie Creek site, a Mississippian homestead in the west-central southern Illinois upland till plains, also reveals a localized pattern of faunal exploitation, but one with a more limited resource base that may be contingent on seasonal, environmental, or social variables.

CHAPTER VII. BOTANICAL ANALYSIS

William M. Cremin

Introduction

Floristically, the Northfield research area is included in the Oak-Hickory Forest Region of the Western Mesophytic Forest (Braun 1950). However, the local pattern of vegetation is such that it can best be described as comprising a mosaic of plant communities in which the forest-prairie ecotone formerly dominated. The Bonnie Creek site is situated so as to have afforded its residents relative ease of access to a wide range of resources in the forested creek bottoms, wooded uplands, and grassland areas occurring in close proximity to the site.

Methods

This analyst received from American Resources Group, Ltd., a total of 53 bags and vials of carbonized plant remains together with analytic sample sheets from 30 flotation samples extracted from 28 proveniences. For those soil samples for which the volume had been recorded, volumes ranged from 4-80 liters. These were collected during the troweling of structure floors (n=4 samples) recovered from within and around a broken ceramic vessel (n=2) and extracted as soil column samples during cross-sectioning of the following types of pit features: smudge pits or (n=14); shallow basin-shaped (n=6), deep basin-shaped (n=2), and flat-bottomed (n=1) refuse pits; and a pit of indeterminate function (n=1). The soil samples were processed in the field by means of the tub agitation method, after which the light and heavy fractions were air dried and bagged separately for shipment to the American Resources Group, Ltd., laboratory.

All flotation residues were initially sorted by American Resources Group, Ltd., personnel, with the botanical material being separated into the categories of corn residues, nutshell, seeds, wood charcoal, and unidentified plant parts prior to submission to this analyst of all material except the recognized wood charcoal. With respect to wood charcoal, it should be mentioned that aside from some small pieces (including a few specimens that were at least minimally identifiable) that were found among the nutshell in a number of samples, all references to wood charcoal counts and weights have been derived from the analytic sample sheets accompanying each of the 30 flotation samples.

In the laboratory, all sorting, counting, and detailed identifications of the botanical material were accomplished using 10X-20X magnification and reference to standard manuals for wood and seed identification (Core et al. 1979; Martin and Barkley 1961; Montgomery 1977; USDA 1974) and works by specialists in the archaeobotanical study of cultivated plants (Carter and Anderson 1945; Cutler and Blake 1973; Ford 1973; Nickerson 1953). In addition, many specimens, both wild and domestic, were compared with fresh and carbonized material collected and prepared by the analysis and maintained as a synoptic set in the archaeology laboratory at Western Michigan University.

Data Presentation

Table 43 summarizes the plant residues recovered from 30 samples representing 28 proveniences from the Bonnie Creek site. Note that

1. The total counts and weights recorded for Zea mays, or corn, in the flotation sample from feature 2 and the sample from feature 35 represent subsamples of 50% and 25%, respectively. If one estimates the total quantities of corn in the light fractions from these samples, the aggregate would be 45 g and 3,894 specimens of corn for feature 2 and 157.62 g and 10,444 pieces for feature 35 rather than the quantities that are recorded in Table 43; and

2. The great majority of wood charcoal from these samples was extracted and quantified by American Resources Group, Ltd., personnel, with both precise and some approximate counts and the total weights for each being reported on the analytic sample sheets.

It is estimated that 384+ liters of soil comprising the 30 flotation samples contained approximately 18,300+ carbonized plant specimens, aggregating 402.91 g by weight, of which 7,564 specimens weighing 148.84 g were available for this analyst to study.

Wood Charcoal

Residues of charred wood are a common constituent in the assemblage, reportedly occurring in flotation samples from 24 of 28 proveniences and aggregating 120.00 g by weight. Only 0.30 g (n=14) of wood charcoal was examined, this material being extracted from the nutshell residues occurring in two smudge pits and a single shallow basin-shaped feature. Of this material, 11 specimens are ring porous, 2 are diffuse porous, and 1 has been identified as red oak (Quercus rubra). The size of these very small scraps of wood precluded more precise identification.

Of the 23 proveniences containing wood charcoal for which the volume of soil floated has been recorded, most yielded only trace quantities. Weight by sample ranged from less than 0.01 g--4.06 g per liter of soil floated, with the mean density for all proveniences being 119.72 g/364 liters of soil = 0.33 g per liter. The density recorded for the smudge pits is 84.92 g/109 liters = 0.78 g per liter; for pit

Table 43. Plant Remains from Site 21C4-46.

Lot No.	ARG No.	Provenience	Sample Volume (liters)	Contents wt(g) / ct		Comments
1	6	Feature 2	10	22.50 (50% sample)	1947	Zea mays, corn cob and cupule fragments from 8, 10, 12, and 14 row ears, with cupule width for measured specimens ranging between 4-8 mm
				0.20	4	Unidentified wood charcoal
2	44	Unit 160 N, 190E (Level 3, floor trowelings)	10	0.32	11	Carya spp. nutshell
				0.20	15	Unidentified wood charcoal
3	113	Unit 258.5N, 186E (Level 3B)	10	0.60	20	Unidentified wood charcoal
						(14 uncarbonized seeds of Chenopodium album and Polygonum spp.)
4	164	Feature 34 (N 1/2)	4	0.01	2	Z. mays cupule fragments
				0.38	6	Carya ovata, shagbark hickory
				0.18	3	C. laciniosa, shellbark hickory
				0.64	47	Carya spp. nutshell
				0.20	4	Juglans spp.
				0.60	20+	Unidentified wood charcoal

Table 43. (cont'd).

Lot No.	ARG No.	Provenience	Sample Volume (liters)	Contents wt(g) / ct		Comments
5	165	Feature 35	9	37.29 (25% sample)	2482	Z. mays kernels and cob and cupule fragments from 8 and 10 row ears, with cupule width for measured specimens being 7-8 mm and kernel thickness 3-5 mm from the light fraction
				8.46	516	Z. mays residues from the heavy fraction, including cob and cupule fragments and kernels from 8 and 10 row ears, with cupule widths from 4-6 mm and kernels being 4-7 mm thick
6	166	Feature 36 (N 1/2)	20	1.90	-	Unidentified wood charcoal
						(11 uncarbonized seeds of C. album, lamb's quarter)
7	167	Feature 33	10	4.38	138	Z. mays cob and cupule fragments from 10, 12, and 14 row ears, with measured cupule width of 5-8 mm
				0.28	8	Fragments of squash rind (probably Cucurbita pepo or summer squash)
				0.08	1	Unidentified seed or nutlet
				8.56	151	Unidentified wood charcoal

Table 43. (cont'd).

Lot No.	ARG No.	Provenience	Sample Volume (liters)	Contents wt(g)	ct	Comments
8	171	Feature 37	10	2.03	67	Z. mays kernels and cob and cupule fragments from 8, 12, and 14 row ears, with cupule width ranging between 7-10 mm and kernel thickness of 2-5 mm
				0.12	2	Juglans nigra, black walnut
				0.18	8	Carya spp. nutshell
				20.51±	350±	Unidentified wood charcoal
9	172	Feature 39	10	9.84	180	Z. mays kernel and cob and cupule fragments of 8 and 12 row ears, with measurable kernel thickness ranging between 3-5 mm
				0.33	23	Carya spp. nutshell
				0.12	4	Juglans spp.
				0.13	11	Ring porous wood charcoal
				0.94	50+	Unidentified wood charcoal
10	173	Feature 38	5	7.61	50	C. laciniosa
				0.82	6	C. ovata
				15.07	694	Carya spp. nutshell
				0.31	3	Juglans spp. nutshell

Table 43. (cont'd).

Lot No.	ARG No.	Provenience	Sample Volume (liters)	Contents wt(g) / ct		Comments
10	173	Feature 38		0.11	1+	Unidentified seed(s) represented by 15 fragments
				20.31	47+	Unidentified wood charcoal
11	178	Feature 41 (S 1/2)	10	4.44	161	Z. mays kernels and cob and cupule fragments from 8 and 12 row ears, with cupule width ranging from 4-8 mm and kernel thickness between 2-3 mm
				0.09	1	Quercus rubra, red oak charcoal
				60.00	-	Unidentified wood charcoal
12	181	Feature 46	20	0.08	1	C. ovata
				0.08	1	J. nigra
				0.09	3	Carya spp. nutshell
				0.02	1	Unidentified tree bud (charred)
				17.30	-	Unidentified wood charcoal
13	182	Feature 48	4	0.16	1	J. nigra
				0.07	1	Carya spp. nutshell
				6.10	200+	Unidentified wood charcoal

Table 43. (cont'd).

Lot No.	ARG No.	Provenience	Sample Volume (liters)	Contents wt(g)	/ ct	Comments
14	184	Feature 47 (N 1/2)	10	0.72	34	Z. mays cob and cupule fragments from 12 and 14 row ears, with cupule width ranging from 4-6 mm
				0.70	14	Carya tomentosa, mockernut hickory
				0.09	1	Juglans spp. nutshell
				0.01	2	Seeds of Rhus copallina, dwarf sumac
				0.08	2	Diffuse porous charcoal
				16.80	-	Unidentified wood charcoal
15	185	Feature 50	10	0.19	8	Carya spp. nutshell
16	186	Feature 49	40	0.10	2	Carya spp. nutshell
				4.60	-	Unidentified wood charcoal
17	187	Feature 51	10	3.59	72	Z. mays kernels and cob and cupule fragments from 8 and 12 row ears, with cupule widths of 6-10 mm and kernel thickness ranging between 2-4 mm
				0.95	3	C. tomentosa
				3.60	-	Unidentified wood charcoal

Table 43. (cont'd).

Lot No.	ARG No.	Provenience	Sample Volume (liters)	Contents wt(g)	/ ct	Comments
18	189	Feature 52	10	2.80	10	Carya spp. nutshell
19	190	Feature 42 (S 1/2)	30	0.05	2	Z. mays cupule fragments
				0.23	8	Carya spp. nutshell
				1.10	25±	Unidentified wood charcoal
20	191	Feature 42A (N 1/2)	10	0.01	1	8 row cupule fragment of Z. mays
				0.15	10	C. ovata
				0.41	3	J. nigra
				0.40	10	Unidentified wood charcoal
21	193	Feature 42B (N 1/2)	12	0.01	1	Z. mays kernel fragment
				1.00	80	Carya spp. nutshell
				0.10	15±	Unidentified wood charcoal
22	196	Feature 43 (N 1/2)	4	2.46	98	Z. mays kernels and cob and cupule fragments of 8, 12, and 14 row ears, with cupule widths of 4-9 mm and kernel thickness of 3 mm
				2.00	62	Carya spp. nutshell
				0.91	13	Juglans spp. nutshell

Table 43. (cont'd).

Lot No.	ARG No.	Provenience	Sample Volume (liters)	Contents wt(g)	/ ct	Comments
22	196	Feature 43 (N 1/2)		7.40	300+	Unidentified wood charcoal
23	230	Feature 44 (Area B)	80	0.04	3	Cupules of *Z. mays*
				0.68	14	*J. nigra*
				2.40	126	*Carya* spp. nutshell
				0.01	1	*Polygonum erectum* achene
				2.20	-	Unidentified wood charcoal
24	235	Feature 75 (S2-18)	20	0.14	3	*Carya* spp. nutshell
				0.18	1+	7 fragments of a bean-like structure. The size projected for a complete specimen would rule out wild beans (possibly *Phaseolus vulgaris*, common bean)
						(An uncarbonized stone of *Prunus serotina*)
25	236	Feature 75 (S2-18)	20	0.20	1	Unidentified nutshell (?)
				3.60	-	Unidentified wood charcoal
26	253	S2-18 (Level 3, 20-30 cm)	10	0.30	20+	Unidentified charcoal
						(3 fresh seeds of *Polygonum* spp.)

Table 43. (cont'd).

Lot No.	ARG No.	Provenience	Sample Volume (liters)	Contents wt(g)	/ ct	Comments
27	258	Structure 2 (Level 3, Feature 12)	10	4.61	329	Z. mays cob and cupule fragments from 8 and 12 ears, with measured cupule width ranging from 4-7 mm
				0.03	3	Carya spp. nutshell
				0.10	1	Juglans spp. nutshell
28	260	S2-18 (Feature 57, N 1/2)	5	3.77	10+	Diospyros virginiana (persimmon) seeds, some with charred particles of flesh attached
				0.10	4	Unidentified wood charcoal
29	263	S2-18 (Feature 57, N 1/2)	10	0.10	3	Carya spp. nutshell
				0.06	1	Achene of Asclepias syriaca, common milkweed
				0.70	-	Unidentified wood charcoal
30	328	Feature 91	10	2.03	173	Z. mays cob and cupule fragments from 8 and 12 row ears, with cupule width for measured specimens ranging from 5-7 mm
				0.26	3	C. pepo rind fragments
				0.09	4	C. ovata
				0.33	3	C. tomentosa

Table 43. (cont'd).

Lot No.	ARG No.	Provenience	Sample Volume	Contents wt(g)	/ ct	Comments
30	328	Feature 91		0.95	76	*Carya* spp. nutshell
				2.50	200+	Unidentified wood charcoal
						(100+ uncarbonized seeds of *C. album*, lamb's quarter)

features it is 30.38 g/215 liters = 0.14 g per liter; and for samples from structures, the density is 0.90 g/20 liters = 0.05 g per liter. That the mean wood charcoal density is highest for smudge pits (5.6 times greater than the density calculated for pit features and more than 15 times that recorded for samples from the two wall-trench structures), indicates that burning in a more reduced atmosphere took place in such facilities.

Nuts

Flotation samples from 21 proveniences contained carbonized nut shell residues. These number 1,316 pieces and weigh 41.31 g, or 28.1% of the plant material available for study. If the total estimated weight for all the botanical material (i.e., 402.91 g) in the samples is considered, the nutshell weight reduces to a mere 10.3% of the total. This is the lowest representation of nutshell residues for any site in the Northfield, and perhaps it is also noteworthy that this percentage is significantly lower than the 86.0% observed for the very similar Mississippian farmstead (21D3-67) on White Walnut Creek in Deep Strip #3 of Burning Star Mine #2 previously analyzed by the author (Cremin 1982:14).

For the 19 flotation samples yielding nutshell for which soil volumes have been reported, nutshell densities range from 0.002 g-4.76 g per liter of soil floated. The resulting mean nutshell density is 40.5 g/309 liters = 0.13 g per liter, or approximately one third of the density for wood charcoal. The nutshell:wood charcoal ratio derived from these densities is 0.39 g per liter. Interestingly, these densities and the resulting ratio are very comparable to those derived from the much larger botanical assemblage from the Jamestown site (21C4-14), a large Late Woodland village located a short distance to the south and west of the Bonnie Creek site and overlooking the confluence of Rock Fork, Bonnie, and Galum creeks. Here, the mean nutshell density was .10 g per liter, and the mean density recorded for wood charcoal was .26 g per liter. The resulting nutshell:wood charcoal ratio for Jamestown was .38 g per liter (Cremin 1985:23).

Hickory nutshell represents the dominant material in the class of residues, occurring in every sample from the 21 proveniences yielding the remains of nuts. It comprises 91.8% by weight and 96.4% by count of all nut residues. Carya species identified include three thick-shelled hickories. In decreasing order of frequency of occurrence (n=21), these are: shagbark hickory-5; mockernut hickory-3; and shellbark hickory-2. The remaining nutshell residues have been identified only to the generic level.

That no thin-shelled species (e.g., bitternut hickory, pecan) have been positively identified in the assemblage may be due to this analyst's failure to distinguish such specimens among the very small fragmentary residues. Alternatively, it can be argued that the Mississippian people occupying this site were making more frequent use of thicker hickory nuts. This observation has been noted in the lower Illinois River valley, where archaeobotanists have posited that the

thin-shelled species become less ubiquitious and abundant in assemblages from Archaic through Mississippian times, reflecting a subsistence trend of some potential significance (i.e., Asch and Asch 1981).

The remains of Juglans occur in flotation samples from 11 proveniences, but in terms of both absolute weight (3.18 g; 7.7%) and count (n=47; 3.6%), they comprise a minor portion of the nutshell residues. In 5 of 11 cases, it has been possible to positively identify the nutshell as being J. nigra, black walnut. Given the environmental context in which the Bonnie Creek site occurs together with the ubiquity and abundance recorded for these remains relative to hickory nuts, the following would appear warranted: first, that all of the Juglans material is probably black walnut; and second, that both the hickory nuts and walnuts were probably being harvested by the inhabitants of the site in terms of their availability in the immediate environment of the site.

Corn Residues

This class of carbonized plant remains is exceedingly well represented in the Bonnie Creek site samples. Whether one considers the estimated quantity (236.84g; 15,599 specimens) or the smaller amount of material actually available for study (102.47 g; 6,206 specimens), corn residues comprise the bulk (56.9% by weight and 84.3% by count; 68.8% by weight and 82.0% by count, respectively) of the botanical assemblage.

As anticipated, most of the corn occurs in the smudge pit samples. Of 14 features assigned to this type, corn was observed in the flotation samples from 10. The estimated quantity (229.38 g; 15,057 specimens) comprising the smudge pit sample is more than 70 times the amount of corn residues found in five samples from five refuse pits (2.85 g; 213 specimens) and greater than 45 times the quantity of residues recorded for the single sample from a structure floor (4.61 g; 329 specimens) yielding corn.

Referring only to those remains from smudge pit and refuse pit samples for which the volumes of soil floated have been recorded, the following densities have been calculated:

Features	#	Total Volume (liter)	Quantities wt(g)/ ct		Derived Densities g/liter--ct/liter	
Smudge Pits	9	80	71.76	4613	.90	57.7
Refuse Pits	5	140	2.85	213	.02	1.5
Mean densities recorded for 14 samples =					.34	22.0

The corn remains from 16 samples exhibit a preponderance of strongly row-paired cobs, with 8-rowed and 12-rowed residues occurring in 10 samples; 14-rowed in 5 samples; and 10-rowed in 3 samples. Measurable cupule widths range from 4-10 mm, and kernel thickness for specimens complete enough to measure ranges from 2-7 mm.

Those kernels for which it has been possible to determine shape are crescent-shaped. However, while most observations of cupule width and crescent-shaped kernels, together with the presence of large and hard 8-rowed and 10-rowed cobs evidencing strong row-pairing, attest to the predominance of Eastern complex maize or corn (Carter and Anderson 1945) in this assemblage, the frequent occurrence of both 12-rowed and 14-rowed specimens (and possibly some smaller noncrescent-shaped kernels that were not as readily identifiable) may indicate that the inhabitants of the site had not entirely ceased raising older varieties of flint and/or pop corns.

Carbonized Seeds

Seeds are very poorly represented in the residues from the Bonnie Creek site. The total minimum number is 16, and including the particles of flesh or pulp adhering to 10 seeds of persimmon (Diospyros virginiana) in one of two samples collected from the deep basin-shaped pit labeled feature 57, the aggregate weight for this class of remains is 4.04 g. In addition to the above mentioned concentration of persimmon seeds, this same sample yielded a single achene of milkweed (Asclepias syriaca). A large flotation sample from a shallow basin-shaped pit (feature 44) contained a specimen of erect knotweed (Polygonum erectum), and a second such facility (feature 47) produced two seeds of drarf sumac (Rhus copallina).

The most notable specimen in this class of residues is represented by seven fragments of what appears to be a single seed of common bean (Phaseolus vulgaris). This seed food cultigen has been reported for several sites in the Eastern Woodlands dating as early as the eleventh century A.D., becoming increasingly well represented in botanical assemblages thereafter. However, it has seldom if ever been recovered from prehistoric sites in appreciable quantities.

Perhaps noteworthy is the fact that this specimen was found in association with a ceramic vessel (feature 75) during excavation of a wall-trench house (structure 2a). In addition to the bean, the soil sample extracted from within the pot yielded an uncarbonized stone of P. serotina, a minute quantity of hickory nutshell, and several grams of wood charcoal. If, as this analyst suspects, the specimen in question is a common bean, it represents the first documented occurrence of this seed food cultigen in the Northfield research area.

Other Plant Remains

The only residues included in this section represent two occurrences of small quantities of squash (Cucurbita pepo) rind, numbering 11 pieces and aggregating 0.54 g by weight, in a flotation sample from a smudge pit (feature 33) and another from a shallow basin-shaped facility (feature 91). Notably, both samples also contained the residues of corn in small quantities.

Conclusion

Although the aforementioned observations and interpretations derived from them may be skewed by the fact that more than 30% of the soil processed by flotation has been extracted from 13 of 14 features identified by excavators as smudge pits, it appears reasonable to conclude that the Bonnie Creek site is most notable for the reliance of its resident population on the cultivation of corn. When informed that this site represented a "pure" Mississippian component dating to ca. A.D. 1200-1350, the analyst anticipated that corn residues would be present in the botanical assemblage. However, it was not expected that the ubiquity and abundance of this material would be so great relative to natural food remains such as the nuts, fleshy fruits, and starchy seeds to be found in the natural environment of the upper Galum Creek drainage.

Not only are the residues of corn virtually omnipresent on this site, but here are also found the other elements of the "great American triumvirate"--squash and the common bean (albiet in trace quantities). Based on the data presented to this analyst for study, it is most reasonable to conclude that the Mississippian people inhabiting the Bonnie Creek site derived their subsistence from the tropical cultigens, with only modest supplementation from the natural resources of the immediate site environs. Given the excellent preservation of the plant residues, it would appear quite unlikely that differential preservation can be advanced to explain the presence of only a few "scraps" of wild plant seed residues and the very modest quantities of nutshell remains occurring in 30 flotation samples from 28 proveniences sampled on this site.

CHAPTER VIII. CONCLUSIONS

Mark J. Wagner

Introduction

The investigations at the Bonnie Creek site (21C4-46) resulted in the complete excavation of a small Mississippian homestead in the upper Galum Creek valley. The radiocarbon dates (with the exception of a tenth century date not supported by the archaeological data) indicate the site was occupied for a relatively short period of time in the mid- to late thirteenth and early fourteenth centuries with only 88 years separating the three acceptable dates (Table 44). The site ceramics also support a late Mississippian placement, corresponding to the late Moorehead (A.D. 1150-1250) and early Sand Prairie (A.D. 1250-1400) phase ceramics of the American Bottom.

The recovery of three Middle Archaic projectile points from the site plow zone has led Koldehoff (Chapter V) to suggest that a Middle Archaic occupation was also present at the site. This is not unlikely. Excavations at three other ridge spur sites in the mine (21C4-60, -129, and -132) resulted in the recovery of large numbers of Archaic period artifacts. Early and Middle Archaic artifacts also were recovered as isolated specimens from many other sites in the mine. The documented Archaic settlement pattern in the mine consists of the utilization of ridge spurs as short-term hunting and nut collecting camps throughout the Archaic period. Viewed in this context, it is possible that the three Middle Archaic artifacts are the remains of an Archaic occupation disturbed by the later Mississippian occupation. A small amount of Crab Orchard and Late Woodland sherds also was recovered at the site. Similar to the Middle Archaic artifacts, these artifacts are interpreted as the remains of very short occupations that did not result in the construction of subsurface features at the site.

The following discussions of seasonality of occupation, material culture, and site activities are restricted to the Mississippian occupation of the Bonnie Creek site.

Seasonality of Occupation

The Bonnie Creek site is interpreted as a late Mississippian homestead occupied on a year-round basis. The site is defined as a homestead rather than a farmstead as the subsistence data indicate that

Table 44. Radiocarbon Dates.

Feature	Sample Number	Unadjusted Date	*Adjusted Date
Structure 1b	Beta 8478	AD 1330 ± 50	AD 1302 ± 30
Structure 2a	Beta 8479	AD 1220 ± 50	AD 1214 ± 30
Structure 2a	Beta 8480	AD 1290 ± 50	AD 1280 ± 30
Structure 2d-e	Beta 9279	AD 990 ± 60	AD 1000 ± 31

* All dates adjusted following Damon et al. (1974:350-366)

hunting, fishing, and gathering of wild foods were carried out in addition to farming. The size of the social group occupying the site is unknown. Based on the small number of identifiable vessels (n=36) in the ceramic assemblage and the small number of pit features (n=46), it is probable that the site was occupied by no more than one or two nuclear families. The interpretation of the site as a year-round homestead is based on the seasonal availability of the wild plant foods in the botanical sample, ethnographic accounts of southeastern Indian horticultural activities, and faunal data (Table 45). A fall occupation is indicated by the presence of walnuts and hickory nuts which are available for collection in September and October. The presence of cultigens such as beans, squash, and maize that had to be planted, cared for, and harvested indicates a warm weather occupation. Maize was planted as early as March by the more southern southeastern Indian groups, while the more northern groups planted as late as May (Hudson 1976:295). Cornfields were cared for throughout the warm weather months with an early crop harvested in summer and a late crop in September or October. A warm weather occupation also is indicated by the recovery of a small amount of molluscan, turtle, and fish remains at the site. Although mollusks and fish probably could have been obtained on a year-round basis, their primary period of availability was probably the warm weather months (Bloom, this volume).

A late winter/early spring occupation is indicated by the recovery of a deer cranium with shed antlers from feature 44, a large, shallow basin located adjacent to Structural Complex 1. The cranium was associated with a partially articulated deer skeleton, indicating that the carcass was discarded in feature 44 and presumably covered before scavengers could completely dismember it. The implication is that at least one of the five large, shallow basins at the site--feature 44--was empty and ready for refuse disposal in the late winter/early spring. This would support the interpretation of these large basins as truncated storage pits for winter food storage as late winter/early spring would be the most likely time for these facilities to be emptied of their

Table 45. Seasonality Data, Bonnie Creek Site.

Material	Spring	Summer	Fall	Winter
Seeds				
Persimmon			x	
Goosefoot			x	
Dwarf sumac			x	
Milkweed	x	x	x	
Nuts				
Shagbark hickory			x	
Mockernut hickory			x	
Shellbark hickory			x	
Black walnut			x	
Cultigens				
Maize	x	x	x	
Beans	x	x	x	
Squash	x	x	x	
Fauna				
Mussels	x	x	x	
Box turtles	x	x	x	
Fish	x	x	x	
Deer (shed antlers)	x			x

contents. Faulkner and McCollough (1982) have noted that large storage pits are indicators of multiseasonal occupations, i.e., the time the facility is filled (fall), the time it is in use for storage (fall to late winter), and the time the feature is emptied (late winter/early spring). If the large diameter basins at the Bonnie Creek site are indeed storage facilities, then by using Faulkner and McCollough's (1982) definition, they are indicators of a late fall to early spring occupation.

Subsistence

The subsistence data indicate that the Mississippians were much more selective in their utilization of the natural environment of the upper Galum Creek valley than the preceding Late Woodland Indians. The botanical remains from the Bonnie Creek site indicate that a pronounced decrease in the use of wild plant foods occurred during the

Mississippian period. Cremin (this volume) notes that the site inhabitants appear to have been heavily dependent on tropical cultigens --maize, beans, and squash--with only minor utilization of the natural resources of the immediate site environment. This contrasts greatly with the data from Late Woodland sites in the mine which indicate that Meso-American cultigens are absent; starchy seed crops are present but of minor importance; and the botanical assemblage is dominated by nut remains, particularly hickory nuts, during the Late Woodland period (Cremin 1985a, 1985b). The very low frequency of wild plant foods at the Bonnie Creek site suggests an almost total replacement of natural food resources by Meso-American cultigens during the Mississippian period.

This shift away from an intensive utilization of the natural environment is also reflected in the Bonnie Creek site faunal assemblage. Bloom (this volume) notes that the faunal assemblage is indicative of a concentration on mammalian species, particularly the white-tailed deer. Forest edge habitats were the focus of hunting activities while bottomland forests were secondarily utilized. Semi-aquatic mammals as well as amphibians are completely absent. Bird remains consisted of two unidentifiable fragments. Aquatic species (fish and mussels) are represented in minor quantities. In sum, the assemblage indicates a selective exploitation of only a relatively few of the many species that were available in the immediate site environment. In particular, the assemblage appears to indicate that hunting activities were concentrated in the uplands and that the floodplain and creeks were of minor importance. Again, this contrasts with the Late Woodland pattern in the area as exhibited at the Galum Crossing site (21C4-29). Faunal data from this site indicate that the Late Woodland Indians in the upper Galum Creek valley were exploiting a broad spectrum of faunal resources including aquatic, semiaquatic, and terrestrial species (Barr and Bloom n.d.).

In terms of regional comparisons, the Bonnie Creek faunal assemblage is different in species composition from those recovered at Mississippian sites in the Illinois and Mississippi River valleys where terrestrial species form a minor part of the faunal assemblage. At the Hill Creek Homestead site, a relatively late (ca. A.D. 1200) site in the Illinois River valley, fish comprised 79.9% of the identified remains while mammals comprised 17.0% (Colburn 1985:176). Extensive exploitation of fish during the Mississippian period is also evident in the American Bottom, with fish remains comprising 49.1% and 75.4% of the faunal material from the Julian and Range sites, respectively (Kelly and Cross 1984:231). Avian species are also well represented in the American Bottom, ranging from a low 8.8% at the Range site to 41.4% of the faunal remains at the Carbon Dioxide site (Cross and Kelly 1984:231).

The terrestrial orientation present at the Bonnie Creek site, however, is also present at two other Mississippian sites in the till plains, the Bridges site in Monroe County (Hargrave et al. 1983) and the Mike Adamson site in the Rend Lake reservoir (Wagner and McCorvie 1986). The Mike Adamson site is a late Mississippian site consisting of at

least seven structures and associated refuse and smudge pits. The site is interpreted as a possible year-round homestead. The faunal assemblage is very similar to that at the Bonnie Creek site with 84.5% of the remains consisting of mammals, of which 97.9% were deer. Turtles comprised the second most frequent species (11.1%), while birds, fish, and molluscan remains occurred in small quantities. A similar terrestrial orientation is evident at the Bridges site where there appears to be an emphasis on terrestrial mammals, especially deer, squirrel, and raccoon, although fish and avian species are also represented (Oetelaar 1983:313-314, 322).

The high frequency of mammalian species, especially deer, in three separate faunal assemblages from Mississippian sites in interior southern Illinois suggests that the terrestrial nature of these faunal assemblages may be more indicative of a Mississippian adaptation to small stream drainages in the interior rather than reflecting a seasonal occupation. Based on the present data, it would appear that neither fish nor certain types of avian fauna such as waterfowl were available in as great quantities in the interior as they were in the larger river systems and that consequently, terrestrial mammals were of greater importance.

Material Culture

Stone, ceramic, and bone artifacts were associated with the Mississippian occupation at the Bonnie Creek site. The ceramics are predominantly shell tempered with small amounts of grog in some sherds. Jars were the predominant vessel type followed by bowls/pans, plates, and miniature vessels. A pottery trowel was the single non-vessel ceramic artifact recovered. Fabric-impressed pans are present at Mississippian sites in the mine but were not recovered from the Bonnie Creek site. Two vessel types associated with Moorehead occupations in the American Bottom--beakers and juice presses--were not represented at the site.

Jar types included both large jars with angled and everted rims and small jars. A red film or slip was present on the interior lips of some of the large jars. The jars had both cordmarked and plain bodies with the cordmarking extending to the neck on one vessel. Appendages in the form of small tabs or lugs were attached to the rim of one vessel. All of the jars had rounded shoulders. Small jar forms included a globular bodied jar with a short rim and a rounded shoulder jar with a slightly everted rim and small handles.

Plates and bowls/pans were represented by small rim fragments. All had polished surfaces and were finely tempered with shell. Filmed surfaces were present on two plates. Two of the plates had incised surfaces with the design being a variation of a line filled/vacant triangle motif. All of the pans had slightly thickened lips, and three had slightly folded rims. Both bowl fragments had smudged exterior surfaces.

The Bonnie Creek site lithic assemblage, with its high frequency of flake tools, diverse tool assemblage, and intensive utilization of local lithic materials, is suggested by Koldehoff (this volume) to be refelective of a sedentary lifestyle. Other researchers have similarly interpreted high tool diversity as indicative of a general habitation site as opposed to a special or limited activity locus (Kline et al. 1982:37, 46). A heavy utilization of the local glacial chert was evident, with this chert type comprising 34% by weight of all chert. Locally available igneous/metamorphic cobbles were used for manos, hammers, anvilstones, and grinding stones. Sandstone was used for abraders, saws, and posssibly metates. Limonite may have been used as a pigmnent as indicated by limonite/hematite staining on a flat piece of sandstone. Finally, burned examples of all the above rocks were found, indicating they were used either in hearths or possibly for stone boiling.

The large biface, flake tool, and microlith industries are virtually identical to those of the American Bottom (Koldehoff, this volume). The bifacial tool industry included Mill Creek hoes and Burlington adzes that were used until broken or exhausted, after which they became raw material for the creation of a variety of smaller tools including microblades, microdrills, flake knives, gravers, and other tools (Figure 41). Expediently manufactured flake tools made from Crescent Hills, Blair, and glacial till chert were used for cutting activities. The high proportion of bipolar cores at the Bonnie Creek site is interpeted by Koldehoff as a response to the relative scarcity of high quality chert in the Galum Creek drainage. The microlith industry is similar to that of the American Bottom with the exception of a higher utilization of Mill Creek chert at the Bonnie Creek site. A marked difference between the Bonnie Creek lithic assemblage and those from Mississippian sites in the American Bottom is the presence of numerous formalized scrapers at the Bonnie Creek site (Figure 36). This may be associated with the different types of subsistence activities occurring between Mississippian sites in the major river valleys and those in the interior till plains. Faunal analyses from the American Bottom (Kelly and Cross 1984:231) and Illinois River valley (Colburn 1985:176) indicate intensive exploitation of avian and aquatic species in these areas. In contrast, the Bonnie Creek faunal assemblage indicates that terrestrial species, especialy the white-tailed deer, were the focus of faunal exploitation activities in the Galum Creek valley. This intensive exploitation of the white-tailed deer may have necessitated the creation of formalized scrapers that could be used repeatedly for hide scraping activities.

Evidence of interaction with Mississippian groups to the northwest and south of the Galum Creek valley was indicated by the occurrence of nonlocal cherts at the site. The presence of Crescent Hills chert at the site indicates contacts with the American Bottom area. Contacts with Mississippian groups to the south may be indicated by the recovery of Mill Creek, Cobden, and Kaolin chert at the site. Mill Creek chert, however, was widely traded during the Mississippian period, and this material may have entered the Galum Creek valley via the American Bottom rather than directly from the source. Also, by the Mississippian period

both Cobden and Kaolin would have been available in the upper Galum Creek valley in the form of discarded artifacts and debitage on Late Woodland sites. That the Mississippians were collecting material from earlier occupations is evidenced by the presence of Late Woodland projectile points in feature 42 at the Bonnie Creek site.

The two artifacts manufactured from minerals were from Structural Complex 2. A minute copper fleck was present in feature 69 within Structures 2b-e, while a cube of galena was located adjacent to the west wall of Structure 2a. Both galena and copper are nonlocal materials that would have been imported into the upper Galum Creek valley.

Bone artifacts consisted of polished, ground, and cut sections of deer or large mammal bone. One scraping tool and one possible awl were identified.

In sum, the material culture at the Bonnie Creek site is indicative of contacts with other Mississippian groups outside of the upper Galum Creek valley. The ceramics are more similar to those late Mississippian phases in the American Bottom in terms of vessel shape (everted rim jars, bowls, pans, incised and plain plates, and miniature vessels) and surface treatment (plain and cordmarked jar surfaces, red slipped interior jar lips, polished and slipped vessel surfaces) than those of the Big Muddy River valley where cordmarking is virtually nonexistent as a surface treatment (Pauket et al. 1984; Wagner and McCorvie 1986). In terms of lithic materials, the occurrence of Crescent Hill, Ste. Genevieve, and Fern Glen cherts at the site indicate contacts with the American Bottom area, while the occurrence of Union County cherts suggests interaction with Mississippian groups to the south.

Site Activities

Koldehoff provided a preliminary discussion of site activities based on his lithic analysis. Briefly stated, this analysis indicated that stone tool production and maintenance and the processing and preparation of foodstuffs were major site activities. Hunting, cultivating/excavating, and woodworking activities formed a smaller part of the site activities. The lithic analysis data can be combined with that from the other analyses to obtain a more complete picture of Mississippian site activities.

The structure and pit feature analyses indicate that house construction, hide preparation, cooking, food storage, and mortuary activities are represented at the site. The construction of large structures at least partially built from oak and other hardwoods implies a semipermanent or permanent occupation. Hide preparation was an important activity; 24 of the pit features were smudge pits or possible smudge pits. Food storage activities (based on the interpretation of features 42a, 44, 80, 83, and 91 as storage facilities) largely was concentrated near the two structural complexes. Burned soil in the pit features near Structural Complex 1 was interpreted as the residue from cooking activities. Mortuary activities were represented by the

interment of an adult male at the north end of the site and the recovery of fragmentary human skeletal material from the plow zone at the south end of the site.

The subsistence analyses indicate that the Bonnie Creek site functioned as a base from which horticultural, food gathering, hunting, and fishing activities were carried out. Horticultural activities included the cultivation of maize, bean, and squash plants. Horticultural activities may have occurred away from the site, possibly in the creek bottomland immediately below the site. Wild plant food gathering appears to have been of minor importance. All of the nuts, fleshy fruits, and seeds in the botanical assemblage were probably available in the immediate site environment. Hunting activities were concentrated in the uplands, with the bottomland and creeks being of secondary importance. The recovery of a large number of deer elements and a partially articulated deer carcass in feature 44 indicates that, in at least one instance, deer were being taken close enough to the site that the carcass could be returned to the site for butchering.

In sum, a diverse range of activities occurred at the site. This diversity is interpreted as indicating that the Bonnie Creek site was the focus of human activity on a year-round basis during the Mississippian occupation of the site. Although individuals or small groups may have left the site on a periodic basis to exploit seasonal resources or engage in social activities with other Mississippian groups in the area, the Bonnie Creek site was the permanent residence of at least one Mississippian group inhabiting the upper Galum Creek valley. As stated previously, the size of this social group is unknown but was probably no more than one or two families.

Community Patterns

The community pattern at the Bonnie Creek site was formed by at least two separate occupations. The evidence for this comes from Structural Complex 2, where the wall trenches and a smaller set of structures (2b-e) were excavated through those of a larger structure (2a). The site community plan can be examined both synchronically and diachronically. Viewed synchronically, the site community pattern consists of:

1. Two structural complexes containing seven building episodes that are located to the east and west of an approximate 300 m^2 open area. The structures are rectangular (Structures 1a and 1b; 2b-e) to almost square (Structure 2a), and two (Structures 1a and 1b) have gaps within their wall trenches that are interpreted as entranceways into the structure. All of the structures have structure basins with the exception of the very large Structure 2a. Daub was recovered from the Structure 2b-e house depression, indicating that structure was at least partially clay covered.

2. Forty features located between the structural complexes. These pit features appear to be grouped into five clusters that presumably

mark the location of prehistoric work areas associated with specific structures. Based solely on proximity, clusters A and B are interpreted as being associated with Structural Complex 2 while clusters D and E are interpreted as being associated with Structural Complex 1. Cluster C is located intermediately between the two complexes, and its association is uncertain. Feature types include smudge pits, possible smudge pits, large shallow basins (possible storage pits), possible cooking pits, medium shallow basins, and posts. Each of the clusters contains one of the large diameter basins interpreted as storage pits. All of the clusters contained smudge pits.

Analysis of the pit feature clusters and their contents suggest that different types of activities occurred between the two structural complexes. Evidence of hide smudging, food storage, and refuse disposal occurred in all of the feature clusters. Evidence of butchering activities in the form of partially articulated carcasses (feature 44), large quantities of bone, and flake knives is restricted to clusters D and E near Structural Complex 1 and cluster C. Evidence of cooking activities (dark ashy soil, large quantities of charcoal and burned clay, and *in situ* burning) occurs in clusters D and E. The only activity besides food storage, hide smudging, and refuse disposal indicated for clusters A and B near Structural Complex 2 is seed/grain grinding. Four modified cobbles and two possible metates were recovered from feature 80 in cluster A. In sum, the feature data indicate that food storage, hide working, and refuse disposal activites occurred near both structures. Butchering and cooking activities, however, were concentrated around Structural Complex 1; food grinding activities may have occurred near Structural Complex 2.

3. A shallow basin (feature 36) located in the site center approximately equidistant from the two structural complexes. Based on its location, the possibility exists that this feature may represent a marker of some type denoting the site center. Archaeologically, however, the feature appeared as a shallow basin that contained no evidence of its original function.

4. A small midden remnant, grave (feature 30), and a possible smudge pit (feature 53) located at the extreme northern edge of the site. These features were separated by approximately 10 m from the main site area. The midden covered approximately 40 m^2 and contained ceramic, lithic, and faunal debris. The midden probably was larger at one time and was probably reduced in size by farming and erosion. Midden fill was found in the grave (feature 30) which was located outside and to the east of the midden in 1983. A high frequency of cultural material in a 4 m^2 excavation unit (unit 42) to the east of the midden also indicates that the midden once had an eastern extension. The grave (feature 30) contained the burial of an adult male disturbed by plowing and possibly by artifact collectors. The presence of limestone slabs in the plow zone above the burial indicates the grave was partially of stone construction. The faunal analysis indicated that a second midden area may have been present at the southern edge of the site (Bloom, this volume). Interestingly, a very small amount of human skeletal material also was present in this midden area.

Diachronic interpretations of the Mississippian community pattern are problematical because the contemporaneity of the construction episodes in the two structural complexes cannot be established. It is unknown whether Structural Complex 1, Structure 2a, and Structures 2b-e represent three separate occupations or whether part of Structural Complex 2 was contemporary with Structural Complex 1. Ceramic or lithic fits were not found between the pit features or the structural complexes, making it impossible to determine how these features relate to each other. It can be established that at least two separate Mississippian occupations occurred at the site. Structure 2b-e was a small structure whose basin and wall trenches were excavated through the wall trenches of Structure 2a after that structure was abandoned.

There is some evidence to believe that some of the construction episodes in Structural Complex 1 and 2 were contemporary. First, only 22 years separate two of the dates from Structure 2a (A.D. 1280±30) and Structure 1b (A.D. 1302±30), indicating these structures could have been contemporary. Second, the location of the majority of the pit features between the two structural complexes suggests that a central activity area flanked by two structures existed at the site.

If Structural Complex 1 and Structure 2 were contemporary, it may be that the initial Mississippian occupation at the Bonnie Creek site was similar to the dual structure southeastern Indian residence pattern described by Swanton (1946) and Hudson (1976). Structural Complex 1 could represent a winter house that was rebuilt one time during this initial occupation. Only a single hearth was found within the two structures, suggesting that the original hearth was kept when the structure was rebuilt. The internal hearth and structure basin associated with Structural Complex 1 are interpreted as evidence that the structure was a cold weather dwelling. The large basins (features 44 and 91) located adjacent to the structure could represent the remains of storage pits used to cache corn and other food for use during the winter. Structure 2a at the west end of the site could represent a summer house. Evidence that the structure is a warm weather dwelling includes its large size, lack of internal hearth, and lack of structure basin. That Structure 2a represents a single-family dwelling is not inconceivable. Lt. Timberlake's description of the single-family summer house of the Cherokee in the late 1700s indicates that these structures were almost twice the size (approximately 100 to 120 m^2) of Structure 2a (Timberlake 1948:84).

The second Mississippian occupation at the Bonnie Creek site minimally consists of Structures 2b-e. Whether Structural Complex 1 was in use at this time is unknown. Similar to the argument made for Structural Complex 1, this structure could represent a cold weather structure. The two large basins (features 80 and 83) located adjacent to Structural Complex 2 could represent storage facilities for this occupation. Other features probably associated with this occupation include the structure hearth (feature 76), a second possible hearth (feature 69), two internal overlapping pit features (57 and 75) that contained the remains of a large everted rim jar, and a cluster of nine

resharpening flakes from a Burlington tool located south of Structures 2b-e.

Mississippian Settlement Patterns in the Upper Galum Creek Valley

The Bonnie Creek site is part of a late (ca. 1200-1400) Mississippian occupation of the upper Galum Creek valley. Evidence of earlier Mississippian occupation was not found during the course of the investigations in Burning Star Mine #4. Sites with Mississippian components include the Brune (21D3-9), Snake Tree Cemetery (21C4-9), Galum Crossing (21C4-29), Jamestown (21C4-14), Cutler (21C4-34), Lightfoot (21C4-35), Bonnie Creek (21C4-46), and Flying Squirrel (21C4-123) sites (Figure 51). Structures were found at the Jamestown, Galum Crossing, Cutler, and Lightfoot sites, while the Snake Tree site was a Mississippian stone grave cemetery. Shell-tempered ceramics were found in the plow zone at the Flying Squirrel site, but mechanical excavations failed to locate any Mississippian features. Given the highly eroded soils in some areas of the mine, it is possible that the site was destroyed by farming and erosion. Such a situation occurred at the Lightfoot site, where the only Mississippian feature found following the mechanical stripping was a structure with a wall trench depth of less than 10 cm.

Based upon the ceramic and radiocarbon data, Mississippian occupations at the above sites are contemporary with or date slightly later than the Bonnie Creek site. The earliest shell-tempered ceramic material consists of an angular shouldered jar fragment and a short rolled rim from the vandalized Snake Tree Cemetery site and an angular jar from Structure 6 at the Jamestown site. Angular shouldered jars with short rolled rims are associated with late Stirling early Moorehead phase occupations in the American Bottom (Milner et al. 1984:175). Ceramic assemblages with Moorehead characteristics (everted rim jars, incised plates, red slipped interior jar lips, cordmarked jars) were recovered at the Galum Crossing, Cutler, and Jamestown sites in addition to the Bonnie Creek site. Mississippian ceramics were recovered from the plow zone of the Flying Squirrel, Lightfoot, and Jamestown sites and from the structures at the Jamestown site but in too small of quantities for meaningful comparison. Radiocarbon dates from the three Mississippian structural complexes at the Jamestown site indicate that the Mississippian occupation of that site is contemporary with and postdates the Bonnie Creek site occupation. The three adjusted dates from the Jamestown site (each from a separate structural complex) were A.D. 1212±58, A.D. 1302±86, and A.D. 1412±62.

With the exception of the cemetery, all of the other Mississippian sites represent homesteads containing from one to three groups of structures. These homesteads (except for the Jamestown site) are located on ridge spur edges overlooking the creek floodplain. The Jamestown site is located on a rise in the Galum Creek floodplain. This rise is actually part of an old sloping ridge spur that was cut off by the meandering of Galum or Bonnie creeks. All of the Mississippian sites are located in ecotonal areas that would have afforded easy access

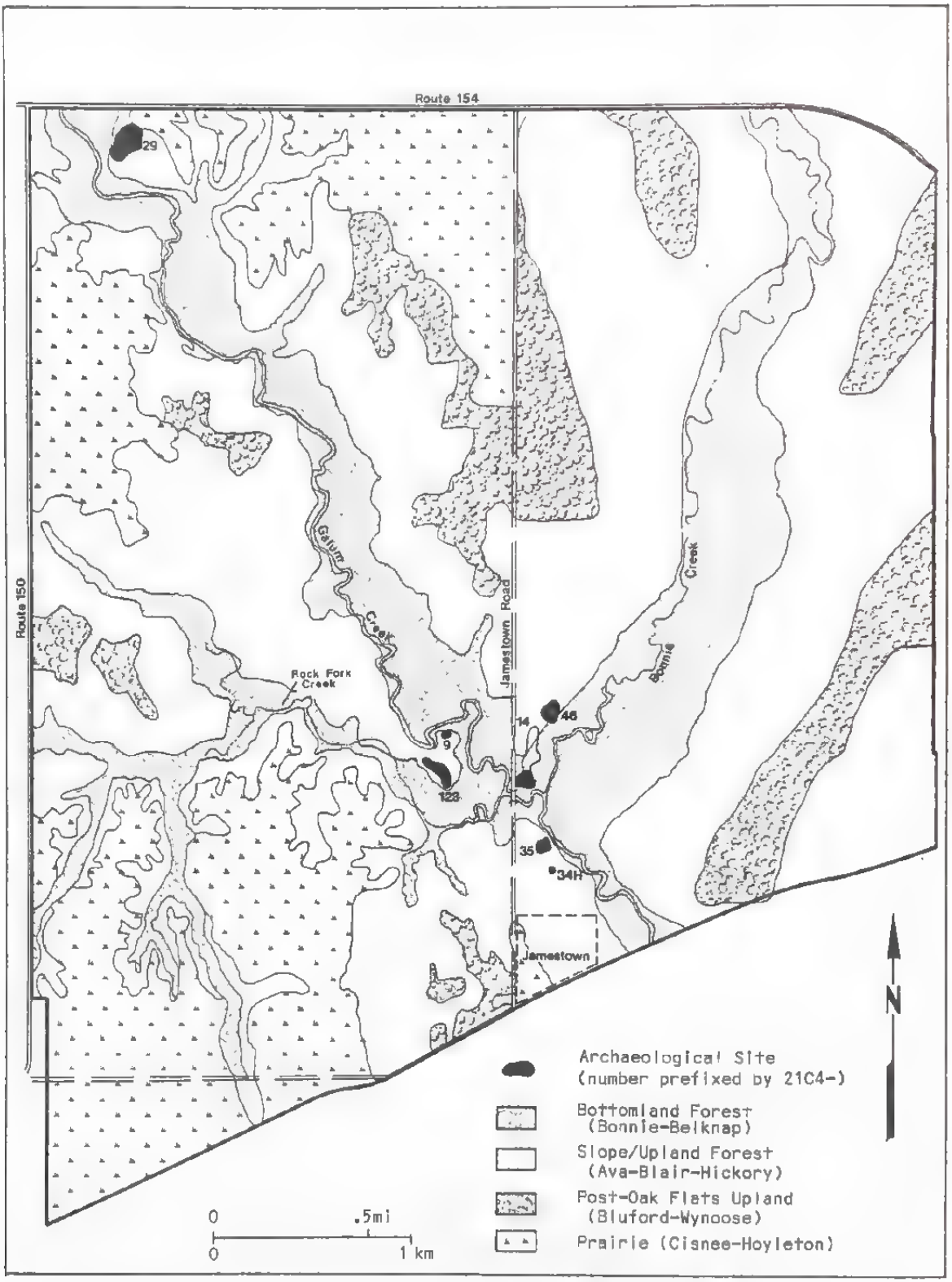


Figure 51. Mississippian site distribution, Northfield study area.

to the upland and bottomland resource zones. Access to agricultural soils may not have been a deciding factor in determining site placement within that part of the Galum Creek valley contained within Burning Star Mine #4. The creek floodplains in the mine are comprised entirely of the highly productive Bonnie-Belknap soil series, and occupation of any ridge spur overlooking a floodplain would have allowed easy access to these soils. Proximity to a permanent water source may have been more of a factor in determining site placement. All of the Mississippian sites within the mine were located either on the main channel of Galum Creek or in the lower reaches of Bonnie Creek, areas where these creeks hold water year-round. Bonnie Creek becomes intermittent immediately above the location of the Bonnie Creek site, and no evidence of Late Woodland or Mississippian occupations were found past the Bonnie Creek site. Similarly, no evidence of Late Woodland or Mississippian occupations was found along Rock Fork Creek, which is an intermittent stream.

With the exception of the Galum Crossing site, all of the Mississippian sites are located near the confluence of Bonnie, Galum, and Rock Fork creeks. This pattern has its antecedent in the Late Woodland period, with the Mississippian sites (except for the Bonnie Creek site) located on former Late Woodland sites. Late Woodland middens were present at the Galum Crossing, Jamestown, and Cutler sites, and it is possible that the Mississippian communities were placed on these sites in order to farm the middens. However, there is evidence that a stronger continuity exists between Late Woodland and Mississippian settlement patterns in the upper Galum Creek valley than simply the advantageous farming of Late Woodland middens. It is probably not without significance that the only Mississippian cemetery in the project area, the Snake Tree site (21C4-9), was located on the same ridge as the only Late Woodland burial mound (21C4-122).

No large Mississippian community that could have served as a nodal community on a higher level of social organization than the individual farmstead was identified within the mine. The documented Mississippian community pattern in the upper Galum Creek valley consists of dispersed homesteads of one or two structures and a cemetery. Clearly, this cannot be the complete Mississippian settlement system for this area of the till plains. Based on archaeological excavations in the American Bottom and other areas of southern Illinois such as the Kincaid site, Mississippian society was highly structured, with individual homesteads comprising the lowest level of community organization. While the settlement system within the upper Galum Creek valley undoubtedly was not as complex as those of the American or Black Bottom, the Bonnie Creek site and other small sites in the area were probably related through social obligations and kinship ties to a larger community similar to the Bridges site in the upper Kaskaskia River valley. Based upon the present survey data for the area, it is not possible to identify any archaeological site that may have served this purpose. The Brune site (21D3-3), which contained an unknown number of structures and a cemetery reported to have contained at least 30 to 40 graves (Pulcher 1974a), may represent one of these proposed larger communities, but this

cannot be determined as the site was destroyed before it could be fully investigated.

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APPENDIX A

Corn Analysis

CORN ANALYSIS

Introduction (Mark J. Wagner)

In addition to the soil flotation samples analyzed by Cremin (this volume), additional samples containing intact corncobs were removed and submitted to Leonard W. Blake, Washington University, for analysis.

Two smudge pits (features 2 and 41) were removed without screening, wrapped in cotton, and sent to Leonard Blake for flotation. Halves of three additional smudge pits (features 33, 90, and 91) were removed in a similar fashion and sent to Blake. Finally, individual corncobs with the matrix still adhering were removed during the excavation of feature 4 and sent to Blake.

The following short report by Leonard Blake is an edited version of a letter report describing the results of corn analyses at several sites. The information pertaining to the other sites has been removed.

Blake has voiced some reservations regarding the corn specimens from feature 33 (Blake, personal communication 1986). The corn in this feature differs from that of other features at the site in terms of row number and size. A smudge pit from a nineteenth century Euro-American farmstead, the Davis site (21D3-246H), was submitted to Blake at the same time as the Bonnie Creek site material, and he wondered if the samples had become mixed. The accession number (AS #168) associated with the sample in question, however, is from the Bonnie Creek site. In addition, the smudge pit from the historic site was floted by American Resources Group, Ltd., with only the corn remains sent to Blake. The smudge pit (feature 33) from the Bonnie Creek site was shoveled out as a block without screening, wrapped in cotton, and sent to Blake. This agrees with the sample analyzed by Blake which was still contained in the clay matrix at the time of analysis (Table 46).

Analysis (Leonard W. Blake)

The collection of corncobs from the Bonnie Creek site does not appear to be directly similar to other limited collections we have seen from southern Illinois. Particularly striking is the comparatively low proportion of 8-rowed cobs, the relatively high proportion of 14- and 16-rowed cobs, and the larger average size of the cobs as indicated by median cupule widths, although a 21 cob sample (excluding feature 33) from the Bonnie Creek site has a mean row number of 10.5, which is the same as that for 41 cobs from the Galum Crossing site (21C4-29). The

Table 46. Corncob Observations.

Provenience	Sample	Specimen Number	Row Number	Kernel Thickness(mm)	Cupule Width(mm)	Segment Length(mm)	Cupule Number	Comments
Feature 2, North Half	AS#8	1	10	3.4	6.9	29.4	8	Sample AS#8 consisted of the north half of a smudge pit that was removed as a unit in the field. The smudge pit was floted by Blake. One cob (specimen 1) and five segments (specimens 2-6) were picked at random for analysis. Specimens 5 and 6 are probably part of the same cob.
		2	10	-	10.3	15.0	3	
		3	10	-	9.6	19.0	4	
		4	8	4.0	8.8	16.0	4	
		5	12	-	8.1	14.6	3	
		6	12	-	8.0	8.2	2	
		7	10	-	10.0	15.1	3	
Feature 2.	AS#5	1	10	4.1	8.5-9.5	20.5	5	This sample was received in matrix and floted by Blake.
		2	10	3.6	10.2	18.0	5	
		3	10-12	3.5	6.0	17.5	5	
Feature 90	AS#320	1	10	3.6	7.9	14.5	4	This sample was received in matrix and floted by Blake.
Structural Complex 2.		1	10	-	8.3	9.0	2	This sample was collected by hand from the Structure 2b-e house basin fill.
		2	12-14	-	7.4	7.5	2	
Feature 4	AS#11	1	12	3.6	6.3	18.0	5	This sample was floted by ARG. Wood charcoal consisting of twigs was also present.
		2	10?	-	7.1	11.0	2	
		3	?	4.4	6.2	17.7	4	
Feature 91	AS#328	1	10	3.6	7.1	14.3	4	This sample was received in matrix and floted by Blake. Other cupules that appear to be part of these two specimens were also present.
		2	12	-	6.5	8.3	2	
Feature 41	AS#149	1	8	3.0	10.3	19.0	6	This sample was received in matrix and floted by Blake. Wood charcoal was also present.
		2	10	3.4	6.3	19.5	5+	
		3	10	3.5	6.5	19.0	6	
		4	10	-	7.2	13.2	4	
Feature 33.* North Half	AS#168	1	12	3.2	7.5	34.0	9	Cob section
		2	12	2.9	5.9	34.4	10	Cob section, tip
		3	14	3.6	5.4	32.0	8-9	Cob section, tip
		4	12	3.3	6.6	60.5	17	Cob section
		5	14	3.4	7.2	38.6	12	Cob section
		6	8	3.8	10.5	50.3	12	Cob section
		7	12	3.6	9.3	35.0	7	Cob section
		8	14	3.5	5.8	40.3	11	Cob section
		9	16	3.5	6.1	38.0	9	Cob section
		10	10	3.1	7.1	22.0	7	Cob section
		11	8	3.8	9.2	30.0	8	Tapered cob section near but not at tip
		12	12	3.9	8.4	22.5	6	Tapered cob section near but not at tip
		13	12	2.9	7.3	32.0	9	Cob section
		14	10	3.6	7.5	22.0	7	Cob section

* This sample was received in matrix and floted by Blake. The corn resembles that from the historic Euro-American farmstead (21C4-246H). See introduction to this section.

Table 46. (cont'd).

Provenience	Sample	Specimen Number	Row Number	Kernel Thickness(mm)	Cupule Width(mm)	Segment Length(mm)	Cupule Number	Comments
Feature 33.* North Half	AS#168							
		15	10	4.3	8.0	27.8	7	Cob section, slightly tapered
		16	10	3.4	7.9	56.5	17	Cob section
		17	16	3.8**	7.2**	28.5	9+	Cob base with piece of shank (10 x 12 mm) attached
		18	12	3.6	8.6**	26.0	7	Cob section
		19	10	3.4	8.0	26.5	6	Cob section
		20	14	3.5	6.4	37.0	11	Six cupule segments
		21	12	3.4	5.6	27.0	7	Cob section
		22	12	3.4	7.1	27.0	6	Cob section
		23	10	3.4	7.0	27.3	8	Cob section
		24	14	3.6	6.7	23.0	5	Tapered cob section
		25	10	3.6	7.8**	26.0	5	Cob section
		26	12	3.8	6.4	24.0	6	Cob section
		27	12	3.7	7.3	44.0	12	Three cupule segments
		28	10	3.7	7.5	21.2	8	Cob section
		29	10	3.4	6.0	-	-	Cob section broken in handling
		30	14	3.1	5.1	25.0	7	Cob section
		31	10	3.4?	7.9	22.7	5	Cob section
		32	10	3.5	7.3	25.0	6	Cob section
		33	12	3.6	6.0	30.0	8	Two cupule segments
		34	12	4.0	9.2	27.0	7	Two cupule segments
		35	16	3.3	5.0	22.5	5	Cob section
		36	12	3.5	7.3***	26.0	5	Cob section
		37	10	3.4	7.0	18.7	5	Cob section
		38	12	3.6	7.2**	21.0	5	Cob section
		39	10	3.4	7.9	30.0	9	Single segment of cupules

**Averaged values
***Exclusive of two aborted rows

proportions of row numbers are different, and the median cupule width of the latter is considerably less. The mean row number of the entire sample of 60 cobs from the Bonnie Creek site is similar to that of a 36 cob collection from the Mississippian Mansker site (24A2-8) of an unknown date in Randolph County, but the samples do not appear to be directly comparable.

Corn collections of about the same date as those from the Bonnie Creek site which we have seen from Mississippian sites in the southern half of Illinois have much larger proportions of 8- and 10-rowed cobs and much lower average row numbers. Examples are corncobs from the Consol site (21B2-26) of about A.D. 1210-1260 in Jackson County and from feature 197 in the Merrell Tract, immediately west of Cahokia Mound (11-Ms-23) of about A.D. 1250-1500 in Madison County (Table 47).

Table 47. Comparison of Bonnie Creek Site Corn with Corn from Selected Sites.*

Site	Sample Size** (# Corncobs)	-----Percentage of Corncobs by Row #------ 8 Row	10 Row	12 Row	14 Row	16+ Row	Mean Row No.	Median Cupule Width (mm)
Bonnie Creek Site (21C4-46)								
(1) Excluding F-33	21	9	62	24	5	-	10.5	7.9
(2) Feature 33	39	5	33	39	15	8	11.7	7.2
(3) Including F-33	60	7	43	33	12	5	11.3	7.3
Cutler Site (21C4-34)	5	-	80	-	20	-	10.8	7.6
Galum Crossing Site (21C4-29)	41	25	29	44	-	2	10.5	6.4
Mansker Site (24-A2-8)	36	17	22	44	17	-	11.2	6.8
Consol Site (24B2-26)	12	50	42	8	-	-	9.2	7.6
Cahokia Site (11-Ms-23), Merrel Tract, Feature 197	118	45	40	14	1	-	9.4	6.1
Davis Site (21D3-246H)	31	10	10	42	32	6	12.3	7.0

*All of the sites are Mississippian with the exception of the Davis site (21D3-246H), which is a Euro-American Upland South homestead (A.D. 1840-1865) in Perry County, Illinois

**All corn was carbonized and not adjusted for shrinkage (estimated to have been 15% to 25%)